INTERFACE AGE™

COMPUTING FOR HOME AND BUSINESS APPLICATIONS

VOLUME 4, ISSUE 7 JULY 1979 $2.00
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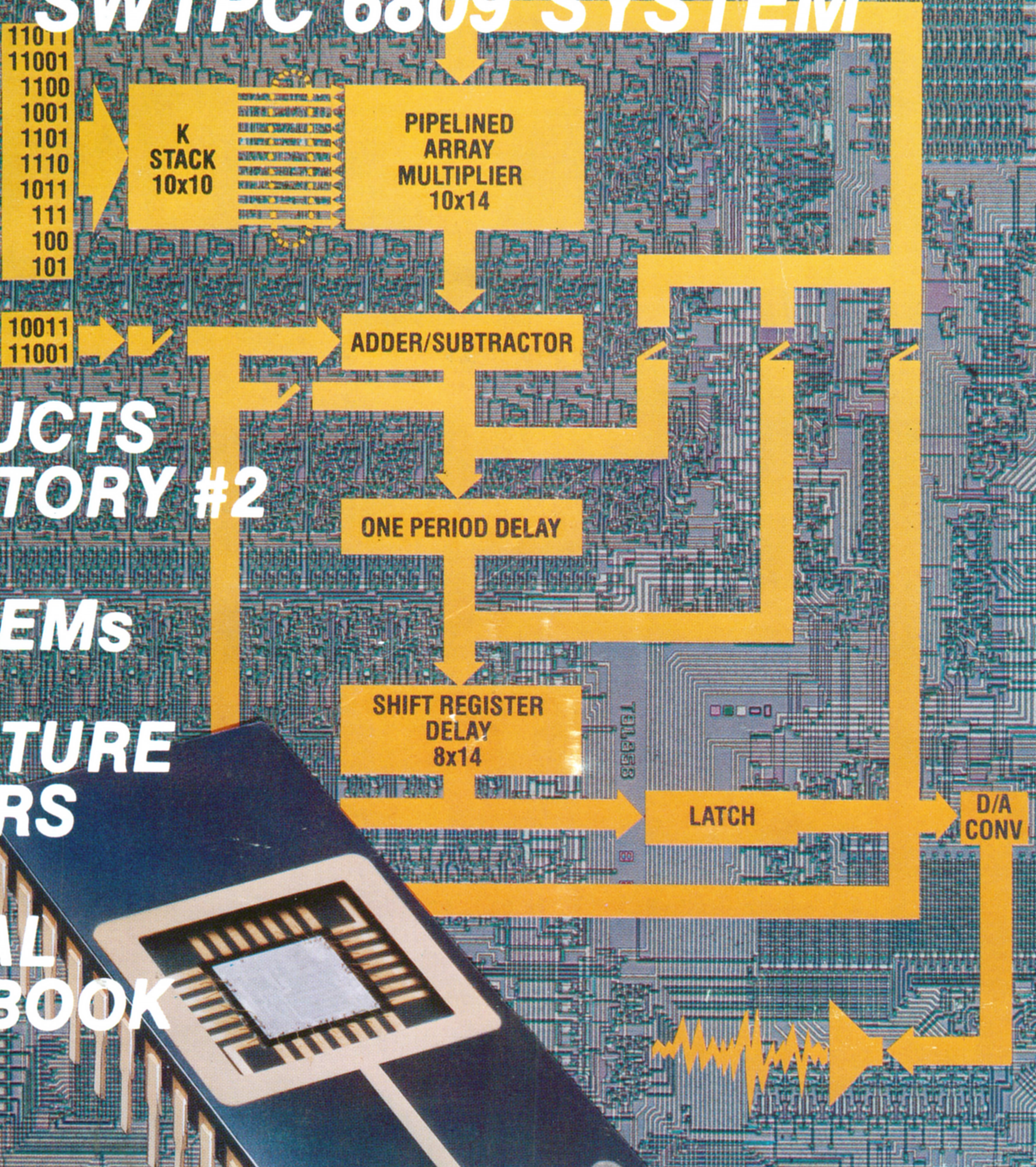
RADIO SHACK TRS-80 MODEL II
SWTPC 6809 SYSTEM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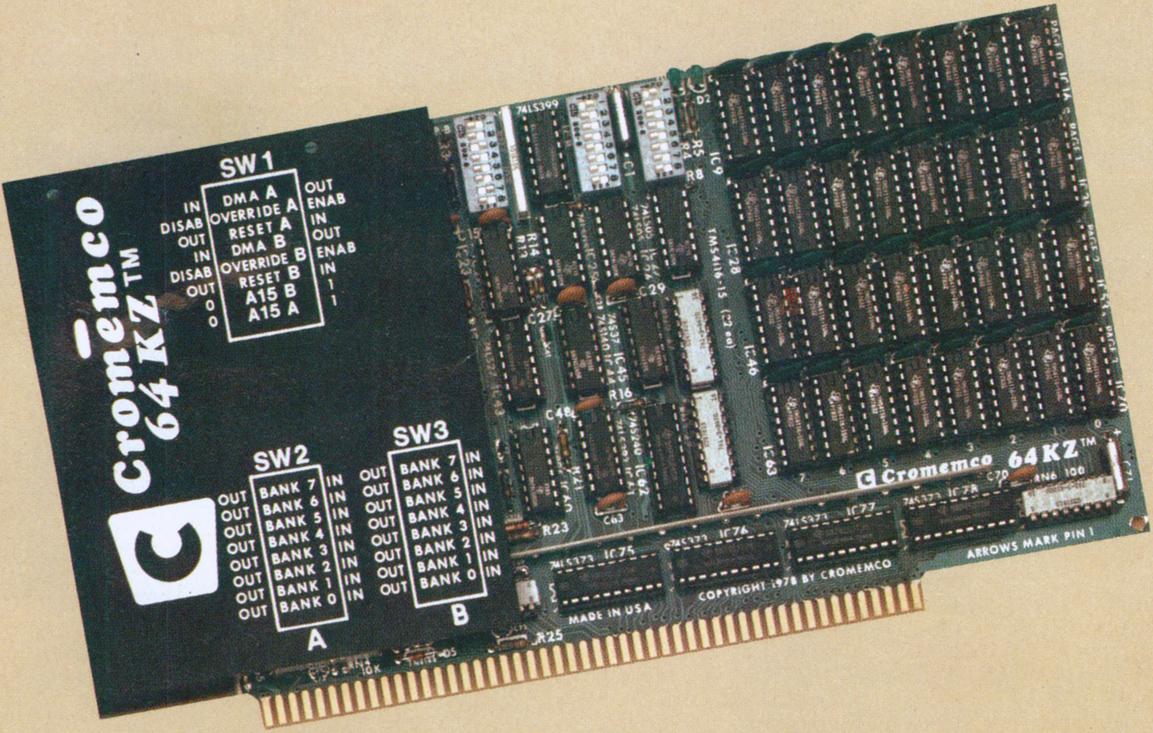
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You can do surprising things when you have 64 kilobytes of fast RAM on one card

4 MHz FAST—AND EXPANDABLE

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Or, with our Extended Bank Select feature, you can expand memory space to as much as 16 megabytes.

This expandability we call your obsolescence insurance.

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VOL. 4, ISSUE 7
SINCE DECEMBER 1975
JULY 1979

INTERFACE AGE™

COMPUTING FOR HOME AND BUSINESS APPLICATIONS

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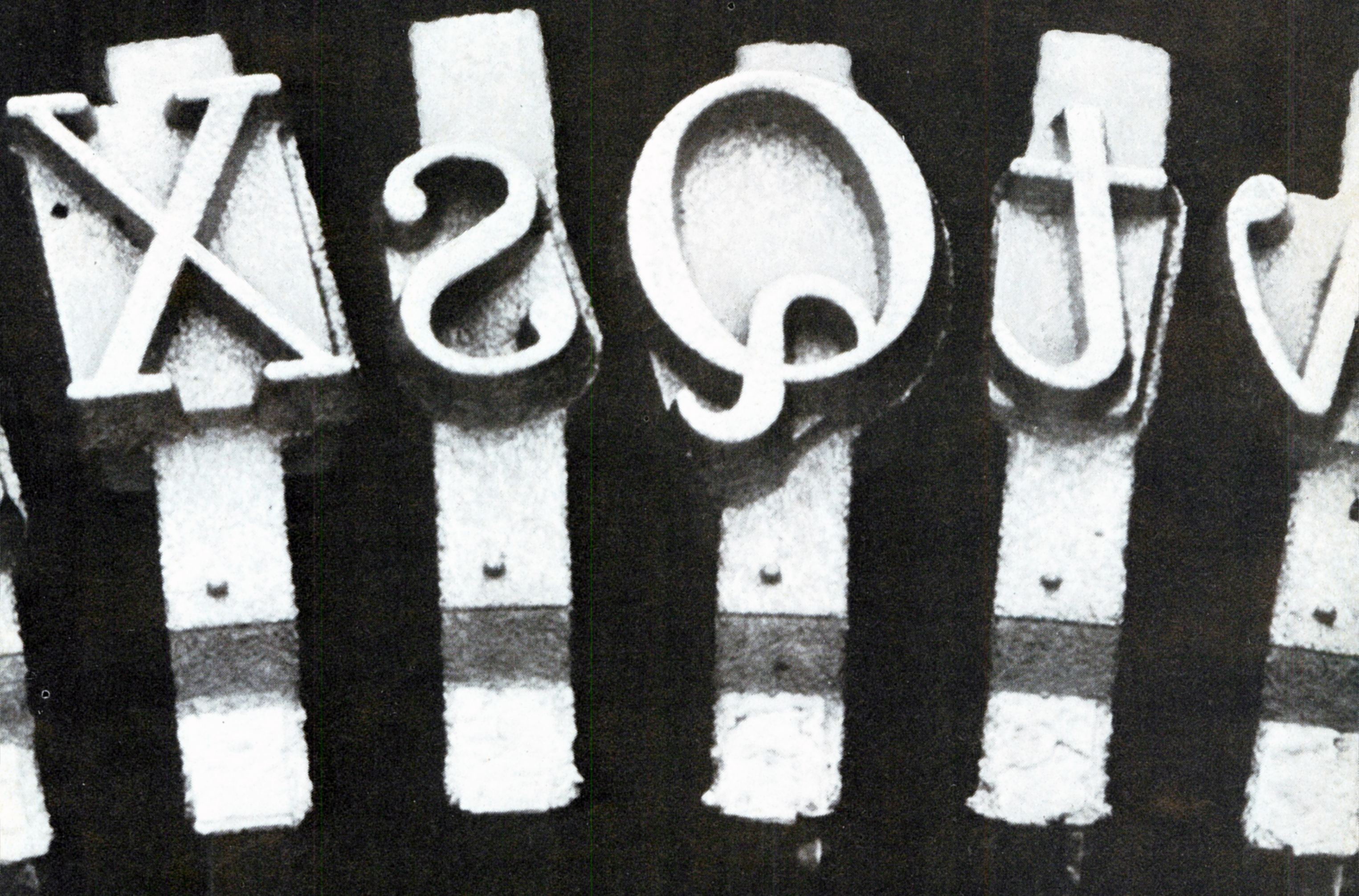

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CIRCLE INQUIRY NO. 15

CAST A SPELL.
WIN A SORCERER.

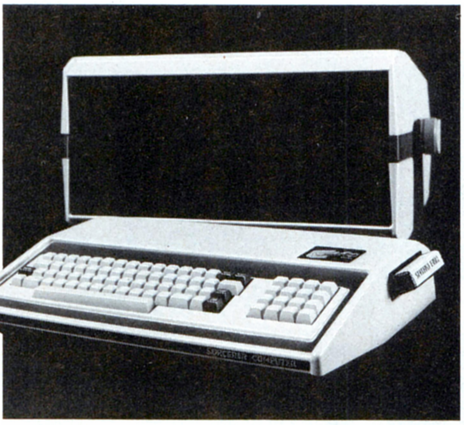
If you've written software in Altair Basic, you've written "spells" for the Exidy Sorcerer.

Now, make it pay off!

There's never enough software. Particularly good software.

That's why Exidy is sponsoring a software contest where nobody loses.

Altair programs run on Sorcerer. The Sorcerer computer's Standard Basic is compatible with Altair 4K and 8K Basic. So our contest is open to programs — we like to think of them as "spells" or "Sorcery" — written in all three of those Basic versions.



WIN THIS EXIDY SORCERER.

Trade one of yours for one of ours. Just for entering a program in our contest, we'll send you a new, professionally written and documented program. Free. It's a classic game of concentration that's a fun mind-stretcher for both kids and adults. Plus you'll get our new 20" by 24" color poster.

And maybe 99 more good programs. We'll publish a bound book of the best programs entered — up to 100 of them, with full credit to each author. If you enter you can have a copy for just the printing and mailing cost. And if your program is included, you get the book free.

And maybe a free Exidy Sorcerer: Submit one of the four programs judged "best," and win a free Sorcerer computer. (Or choose Sorcerer accessories of equal value.) There'll be one winner in each of the following categories: Business, Education, Fun & Games, and Home/Personal management.

Test-run your entry free. Take your program to any participating Sorcerer dealer if you want to give it a test run. At the same time, maybe you'll want to jazz up your program to take advantage of Sorcerer's state-of-the-art features. These include 512 by 240 high-resolution graphics; user-defined characters; and dual cassette I/O, among others.

You can turn in your entry right at the dealer's. And collect your poster and new program on the spot.

Enter now. Send us your entry with the coupon. Or visit your dealer. But cast your best spell at Exidy now. And see if you can't make a free computer appear on your doorstep.

RULES:

1) Entries, including documentation, must be printed by computer or typed double spaced on 8½ by 11 paper, with your name on every page.
2) Enter as many times as you like. This coupon, or a copy of it, must be completed and attached to all entries.
3) Enter at any participating Exidy Sorcerer dealer, or mail entries postpaid to the address on this coupon.
4) Entries must be received by midnight, Aug. 31, 1979. Winners will be notified by Nov. 30, 1979. For a list of winners, send a self-addressed, stamped envelope marked "Winners List" to the coupon address.
5) You warrant, by your signature on this coupon, that all program and documentation material included in your entry is entirely your own original creation, and that no rights to it have been given or sold to any other party, and you agree to allow Exidy to use, publish, distribute, modify, and edit it as it sees fit.
6) All entries become the property of Exidy, Inc. No entries will be returned, nor any questions answered regarding individual entries. No royalties, payments or consideration beyond the items set forth in this advertisement will be given to any entrant.
7) Judging will be by a panel of experts chosen by, and including representatives of, Exidy, Inc. Judges may assign programs to whichever entry category they consider appropriate. Decision of the Judges is final.
8) Employees of Exidy, Inc., its dealers, distributors, advertising agencies and media not eligible. Void where prohibited, taxed or restricted by law.

CIRCLE INQUIRY NO. 19

Exidy inc.

EXIDY, INC.
969 W. Maude Ave.
Sunnyvale, CA 94086

Gentlemen:
Here's my "spell." Send me my free program and poster. If I win, send my Exidy Sorcerer computer to:

NAME ____________________

ADDRESS ____________________

CITY ____________ STATE ________ ZIP ________

DAYTIME PHONE ____________________

TITLE OF PROGRAM ____________________

CATEGORY ☐ Business ☐ Fun & Games
☐ Education ☐ Home/Personal Management

SIGNATURE ____________________ DATE ________

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EDITOR'S NOTEBOOK

Things are really beginning to happen in the industry as evidenced by the West Coast Computer Faire held in San Francisco this past May. Although the show was not attended as well as last year, there were some significant displays.

One of the best was from InterSystems, 1650 Hanshaw Road, P.O. 91, Ithaca, New York 14850, phone (607) 257-0190; Attn: Gary Samuels, Director of Marketing. What they featured was the DPS-1 shown in Photo 1. This box is based on the proposed S-100 bus IEEE standard and features an extremely flexible front panel to aid in system debugging.

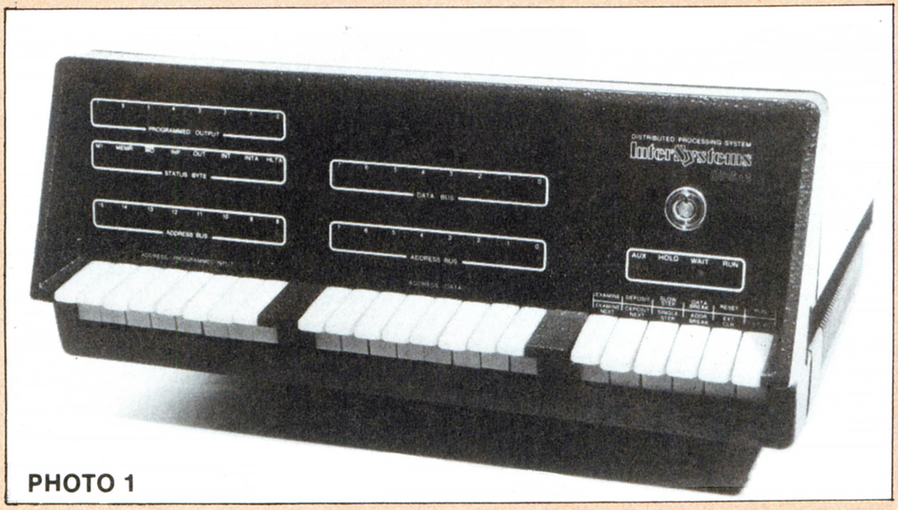


PHOTO 1

The DPS-1 is primarily designed for systems designers and should be considered a professional tool rather than a hobbyist's dream. This system mainframe with the magic front panel looks like it will really be a comer in the next several months.

One of the really exciting exhibits was the HEX-29 from Digital Microsystems, 4448 Piedmont Avenue, Oakland, CA 94611, (415) 658-8650; Attn: Allan Devault, general manager. The system is based on the AMD 2900 series bit slice CPU, which provides for unbelievable processing speeds and system flexibility. The same technology is used on the intelligent I/O channels which makes it possible for the CPU to spend its time doing useful work.

The HEX-29 is not a trivial machine, but is designed as a very high level business processor. A great deal of planning has gone into the complete package with a major emphasis on software. I have planned another trip up to Oakland and will be doing an indepth article on this truly unique machine.

MORE CONSULTANTS AND A CHALLENGE

I recently received letters from two more consultants anxious to make their services known. Steven J. Zucal, BASIC Software Consultants, P.O. Box 27667, Denver, CO 80227. This firm specializes in total custom applications packages. They keep in close contact with the customer and provide a complete line of paper goods and magnetics along with other DP supplies.

Theodore C. Hines, Director of Children's Media Data Bank wrote to tell me about Rothines Associates, Library & Information Science Consultants, 28 Station Plaza, Great Neck, NY 11021, (516) 466-0178. They specialize in information systems, indexing, wordprocessing, and bibliographic and library applications. This company should be able to answer the needs of many readers who have called and expressed a need in setting up automated MIS functions.

Since I have received so many letters from consultants, and read about their virtues and expertise, I would like to pose a two part challenge.

Here it is: What is R_{317}, who discovered it and what was its proof?

The second part of the challenge is to demonstrate how the FIELD statement in Microsoft BASIC works by telling what it does, FIELDing the contents of a mailing label, and explaining the most efficient way to use it.

To be eligible for this challenge you must be a legitimate consultant and have been mentioned in this column, or letters to the editor in any issue up to and including this one. Send all answers to: Carl Warren, Editor-in-Chief, PO. Box 1234, Cerritos, CA 90701. Answers must be received before September 30. Keep your answers short and to the point. All will be published, so make sure what you send is correct.

SHOPPER'S GUIDE AND NEWSLETTERS

Within the last few days I received copies of two catalogs or magazines that list equipment and supplies. The first: LECTRONICS EMPORIUM, Attn: Dick Costello, Box 828, Derry, NH 03038. This little publication costs $3 per year for a 12 issue subscription and provides an inexpensive forum for individuals and small companies to advertise in.

The other publication is MISCO, The Minicomputer Supplies Company, 963 Holmdel Keyport Road, Box 399, Holmdel, NJ 07733, (800) 631-2227. This is essentially a supplies and accessories catalog which lists all those supplies that you need to keep your DP operation running. The company makes money by selling supplies, not catalogs, but is a handy source guide of where to get it.

Many of you have called and written wondering about The Digital Group. They are still in business to a degree and trying hard. To help them in their efforts, Lloyd Kishinsky publishes BRIDGE, the publication of the DG Independent Users Group. The cost is $6 for six issues and can be ordered from DG Independent Users Group, P.O. Box 316, Woodmere, NY 11598.

BRIDGE is an excellent little newsletter and deserves support. Lloyd will accept support in the form of members, and useful user articles.

Every now and then I have mentioned Bob Howell and his Stringy Floppy. Bob has been working hard and has the system ready for the TRS-80 and the SWTP 6800 system.

The Stringy Floppy uses a continuous tape loop wafer, less than a fourth the bulk of a standard audio cassette and holding up to 40K bytes. This system is really unique and offers a very exciting way of selling software cassettes, if you can imagine buying a tube of software.

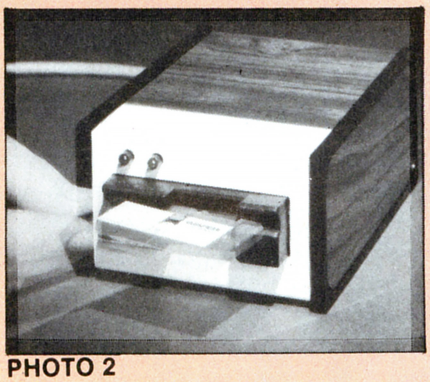


PHOTO 2

Those of you who are interested in finding out more about Bob's Stringy Floppy contact him at: Bob Howell, Exatron, 1030 East Duane, Suite 1, Sunnyvale, CA 94086 or call (408) 737-7111. Those of you in the area might be interested in just dropping in for a users group-workshop meeting on a Saturday morning.

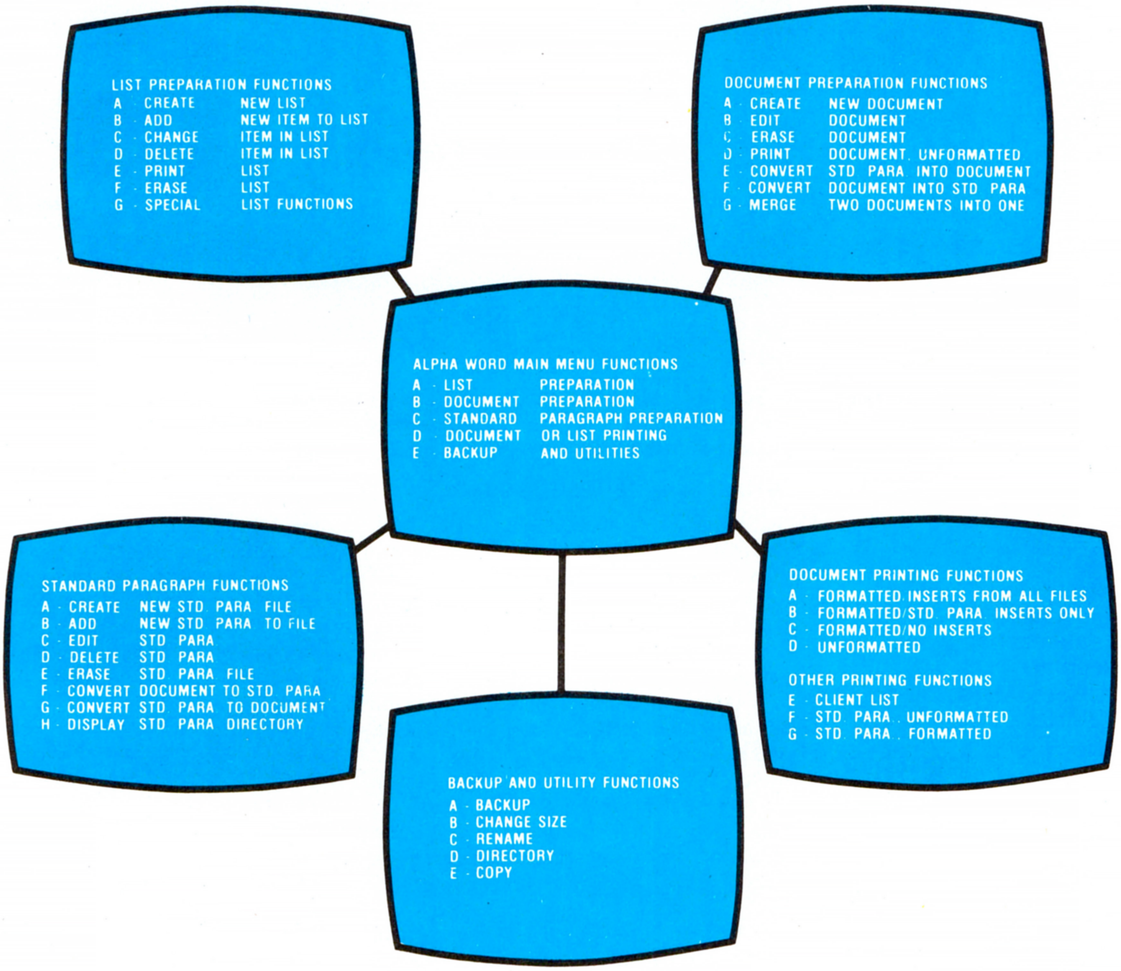
Pretty much everyone has heard of Problem Solver Systems of 20834 Lassen Street, Chatsworth, CA 91311, (213) 998-1500; Attn: Mack Wing. They're the folks who made a name for themselves by making memory boards, controllers and other goodies that go inside computers. Well, as the fates would have it, eventually you do enough designing for other systems that you have developed a pretty classy system of your own. This is just the case for Problem Solvers.

The Exec I, Photo 3, is the latest entrant to the fast paced world of business systems. The system, selling for less than $4,000, offers the functional capability of larger systems, plus offers an unusually high level of reliability. This reliability, according to Wing, is based on the company's experience in building subsystems and ensuring their reliability on a variety of mainframes.

ALPHA WORD™

IDIOT PROOF **MENU DRIVEN**

ALPHA MICRO WORD PROCESSOR



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ALPHA WORD MAIN MENU FUNCTIONS
A - LIST          PREPARATION
B - DOCUMENT      PREPARATION
C - STANDARD      PARAGRAPH PREPARATION
D - DOCUMENT      OR LIST PRINTING
E - BACKUP        AND UTILITIES
```

```
LIST PREPARATION FUNCTIONS
A - CREATE     NEW LIST
B - ADD        NEW ITEM TO LIST
C - CHANGE     ITEM IN LIST
D - DELETE     ITEM IN LIST
E - PRINT      LIST
F - ERASE      LIST
G - SPECIAL    LIST FUNCTIONS
```

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DOCUMENT PREPARATION FUNCTIONS
A - CREATE     NEW DOCUMENT
B - EDIT       DOCUMENT
C - ERASE      DOCUMENT
D - PRINT      DOCUMENT, UNFORMATTED
E - CONVERT    STD. PARA. INTO DOCUMENT
F - CONVERT    DOCUMENT INTO STD. PARA.
G - MERGE      TWO DOCUMENTS INTO ONE
```

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STANDARD PARAGRAPH FUNCTIONS
A - CREATE    NEW STD. PARA. FILE
B - ADD       NEW STD. PARA. TO FILE
C - EDIT      STD. PARA.
D - DELETE    STD. PARA.
E - ERASE     STD. PARA. FILE
F - CONVERT   DOCUMENT TO STD. PARA.
G - CONVERT   STD. PARA. TO DOCUMENT
H - DISPLAY   STD. PARA. DIRECTORY
```

```
DOCUMENT PRINTING FUNCTIONS
A - FORMATTED INSERTS FROM ALL FILES
B - FORMATTED/STD. PARA. INSERTS ONLY
C - FORMATTED/NO INSERTS
D - UNFORMATTED

OTHER PRINTING FUNCTIONS
E - CLIENT LIST
F - STD. PARA., UNFORMATTED
G - STD. PARA., FORMATTED
```

```
BACKUP AND UTILITY FUNCTIONS
A - BACKUP
B - CHANGE SIZE
C - RENAME
D - DIRECTORY
E - COPY
```

ALPHA WORD is a complete word processing system written for the Alpha Micro computer. Your text is managed in six line blocks and is interactively stored on disk to insure against system crashes.

The Document and Standard Paragraph processors have the main features of Alpha Micro's VUE text processor, including line insert and delete, word insert and delete, page skipping, global search and replace, automatic linefeed at the end of the line, block move, copy and delete.

The list processor is structured as a general linked list with user defined data items, and data item keys.

The users manual for ALPHA WORD is written so that your secretary can easily learn the system in a few hours. This is possible through the use of extensive examples and easy to read style. The users manual is available for $15.

Demonstration disks with a capacity of 10 list records and 2 pages of text in document and standard paragraph processors is available for $100 including all software and documentation.

Enhanced versions available to registered users quarterly at $30.
Future versions will include (1) Spelling error correction and detection, (2) Automatic index and table of contents generation, (3) Half justification and hypenations, (4) List search display similar to IBM System 6.

Dealer inquiries invited.

ALPHA WORD software is shipped on an 8 inch floppy disk in standard or AMS format.

— May be used on hard disk systems —

ALPHA WORD is priced at $1500.

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SS 50 • SYSTEM 68

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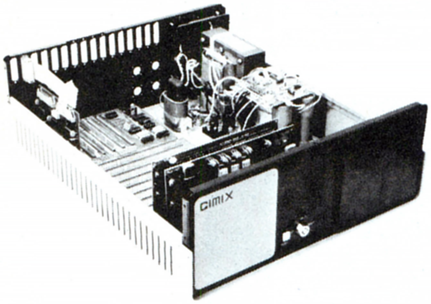

16K Systems

Includes: Mainframe cabinet, mother board, power supply, fan, CPU, 16K static RAM, and choice of I/O card.

$1294.29

Other packages available.

16K Static RAM Boards for the SS-50 Bus

MORE FEATURES:

- Gold bus connectors
- 4 separate 4K Blocks
- Individual Addressing Write Protect, and Enable/Disable for each Block
- Tested at 2MHz

AT A LOWER PRICE **$298.13**
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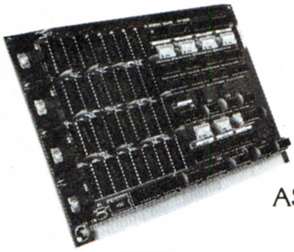

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CIRCLE INQUIRY NO. 21

PHOTO 3

Systems Editor Tom Fox has made plans for reviewing the system in an upcoming issue and it looks like an interesting story.

WHAT ELSE IS HAPPENING

Recently, I had the pleasure to meet with representatives from Motorola regarding Adam Osborne's comments regarding their 6800 product line. We were in agreement that Adam was more right than wrong in some areas and more wrong in others — Adam will be discussing this in a later issue.

What was more important is that we found out about additional developments in Austin and have set up a special trip to cover them. Motorola has some spectacular offerings in the making. But in the interest of good journalism we will not speculate but will report to you the real story in the very near future.

IT'S NOT TRUE

At the West Coast Computer Faire this year, a rumor was generated about Adam Osborne's working relationship with me. Apparently, when Adam's photo was removed from the column, a number of observers considered this an attempt on my part to downplay Adam's importance in the industry.

For the record I consider Adam not only a valuable member of the industry, but a good friend. As friends and members of the INTERFACE AGE editorial staff, we show mutual respect for each other, although a great deal of kidding does go on, particularly regarding Adam's ties. We do not always agree with each other; if we did you would receive a rather dull, one-sided editorial point of view.

STILL MAKING CHANGES

During the past several months we have been making a number of changes in the content of INTERFACE AGE and are planning to continue doing so, as we follow the needs of the readers and the flow of the industry.

Because so much emphasis is on small business, and INTERFACE AGE is currently the only magazine addressing this growing field, we are planning to address it with even greater emphasis as we head into the eighties.

We are planning more and more how-to and why-to articles, plus major tutorials on the uses of languages such as FORTRAN, COBOL and so on.

However, we still need application articles, and would really like to start seeing business articles for all machines currently available in the marketplace. Here is a partial list of machines that we would like all you business authors and 'consultants' to address:

APPLE, TRS-80 and the new Radio Shack machine, featured this month, the Heath machines — quit telling us how great they are and start showing us what they can do in the business world. The Ohio Scientific machines, Cromemco, Info 2000, Wang, the DEC and Data General machines.

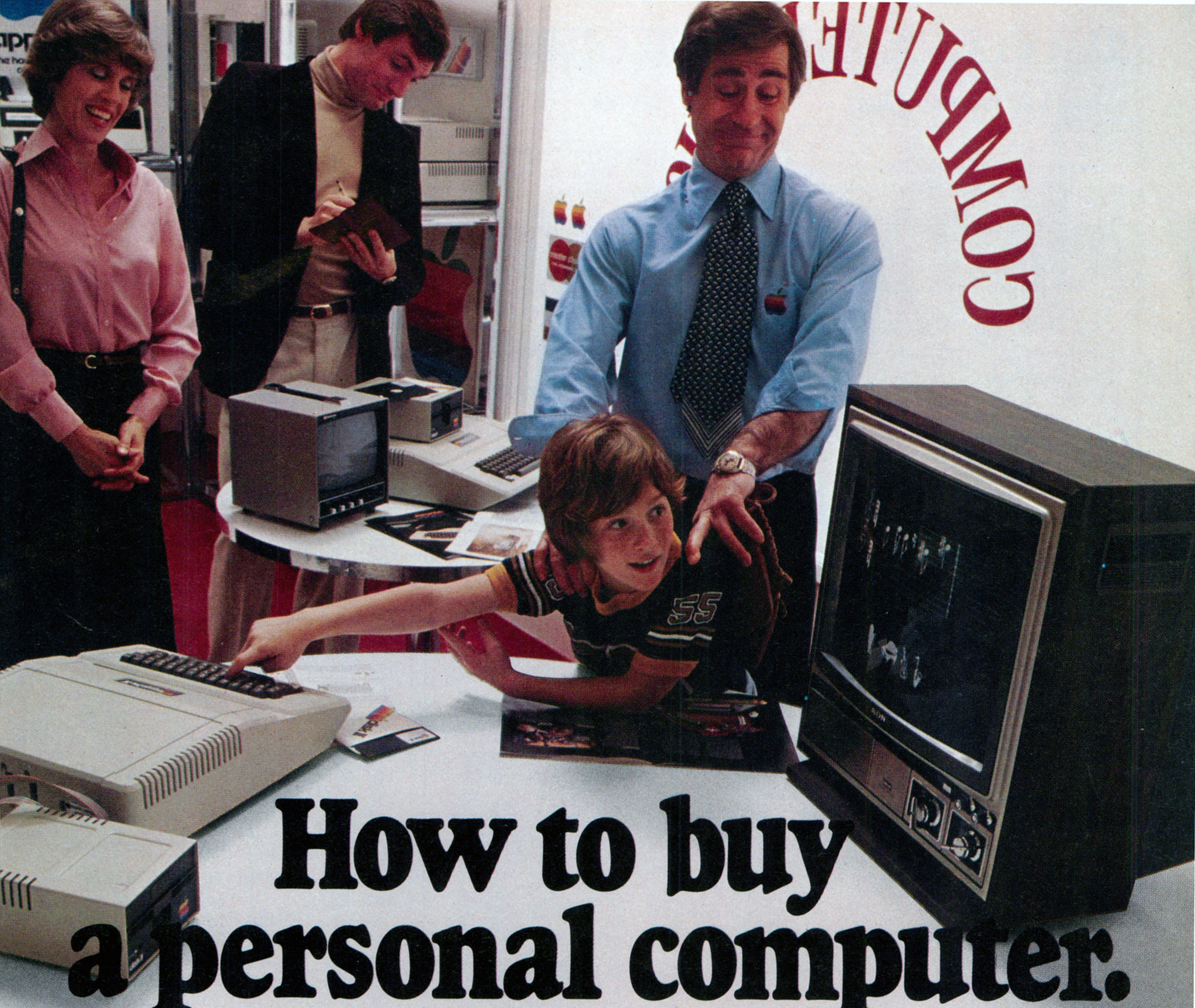
We are hoping for well written articles on inventory control, general ledger, accounts payable, receivable, report generation, even payrolls and will consider another maillist.

We have some surprises for those of you with Xitan equipment with some very useful business programs coming available for that system. Also for those of you who are in a situation with having one type of machine and BASIC for another we will be offering translation programs that will solve the problem for you.

To help you even more, the best articles from INTERFACE AGE are being compiled and readied in INTERFACE AGE Golden Classics. Several volumes are planned, with the first volume, SOFTWARE, being readied to be introduced at John Dilks' Personal Computer Show in Philadelphia this year.

Those of you who are planning to write your masterpiece will be given a helping hand soon. Dr. John Solensten, one of the top communications experts in the country today, is preparing a new writer's style book, and we have plans to introduce that at John's show. . .so hang in there, there's going to be a lot happening.

carl



How to buy a personal computer.

In California, a store owner charts sales on his Apple Computer. On weekends though, he totes Apple home to help plan family finances with his wife. And for the kids to explore the new world of personal computers.

A hobbyist in Michigan starts a local Apple Computer Club, to challenge other members to computer games of skill and to trade programs.

COMPUTER SHOP

Innovative folks everywhere have discovered that the era of the personal computer has already begun—with Apple.

Educators and students use Apple in the classroom. Businessmen trust Apple with the books. Parents are making Apple the newest family pastime. And kids of all ages are finding how much fun computers can be, and have no time for TV once they've discovered Apple.

Visit your local computer store

The excitement starts in your local computer store. It's a friendly place, owned by one of your neighbors. He'll show you exactly what you can use a personal computer for.

What to look for

Your local computer store has several different brands to show you. So the salesman can recommend the one that best meets your needs. Chances are, it will be an Apple Computer. Apple is the one you can program yourself. So there's no limit to the things you can do. Most important, Apple's the one with more expansion capability. That means a lot. Because the more you use your Apple, the more uses you'll discover. So your best bet is a personal computer that can grow with you as your skill and involvement grow. Apple's the one.

It's your move

Grab a piece of the future for yourself. Visit your local computer store. We'll give you the address of the Apple dealer nearest you when you call our toll-free number. Then drop by and sink your teeth into an Apple. **800-538-9696**. In California, **800-662-9238**.

CIRCLE INQUIRY NO. 4

apple computer

WHERE ARE THE PRINTERS?

Dear Editor:

I am trying to obtain some heat-transfer printers, similar to those included in many of the portable calculators. Would you be able to help me as to:

A) What companies manufacture heat-transfer printers?
B) Which brands are better?
C) Where you would find good retail sources?

Peter Swift
2001 N. Adams St., #629
Arlington, VA 22201

Peter, you might look in our new product directories, or maybe some of the companies will contact you.

LABEL IT BETTER

Dear Editor:

Continue to enjoy your magazine.

Am writing at this time (as I recently had to do to another magazine) to warn you that I received the latest issue with the address label all peeled off except for about half an inch. Since I do not enjoy the thought of being an inch away from not receiving my magazine every month, and since I am sure you would not enjoy the letters I would write you if it did not arrive, I thought you might like to try and correct the problem with the labels. Thanks.

Dr. John Keating, M.D.
Indianapolis, IN

Doctor, your letter was a little unusual. It intrigued me so much I decided to find out about the labels.

When the magazine is printed and bound the subscription copies are shipped to our distribution house — whose responsibility is to label and ship the magazine. This house uses a labeling machine that strips the label, glues and presses it onto the book at the rate of several hundred a minute. The company that does this is mailing for several hundred magazines, pulp mail, etc., so they are pretty good at it. Periodic inspection is made to see if the labels are properly applied. For the most part the labels stay on.

It appears labels come off due to post office handling rather than improper labeling. I sent your label to the mailing house for inspection and they informed me that it had been properly glued and probably properly applied. The problem they feel is with the post office's handling procedure — which, incidentally, I checked out but it would take a whole article or one session of 60 Minutes to explain. I hope that answers your query.

LIKES NEW PRODUCTS

Dear Editor:

Congratulations on the *exceptionally* fine New Products Directory in your March issue. It is extremely well formatted and contains just the right amount of detail for this purpose.

This reaffirms my view that INTERFACE AGE is, by far, the finest publication of its kind available today. Continue the good work!

Roger Hosking
Nyack, NY

Wait 'til you get to page 113 this month.

TRS-80 USER WITH A PROBLEM

Dear Editor:

I have a TRS-80 computer and a Heathkit H-14 line printer. I must now run my TRS-80 thru a RS-232 interface to the H-14's RS-232 interface (parallel to serial to serial to parallel). The H-14 uses a 3870 CPU and I would like to run from my TRS-80 printer port right to the printer's CPU (parallel to parallel).

I am just getting into computers and I don't have the knowledge to do this as of now, so any information you could give me would be of great help.

Glen A. Jenkins
HQ. CO. 1BN. USAISD BX 357
Fort Devens, MA 01433

HEADHUNTERS PAY ATTENTION

Dear Editor:

I saw your note in INTERFACE AGE (April issue) calling for names of personnel looking for jobs. Here is some info:

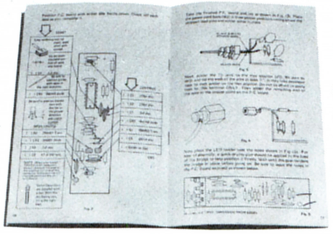
Bachelor's degree in Economics, Masters in Education, 5 years teaching computer programming, 3 years programming on the Wang 2200(VP). Familiar with assembly languages and BASIC.

Present position is primarily administrative and involves planning for automated management information systems.

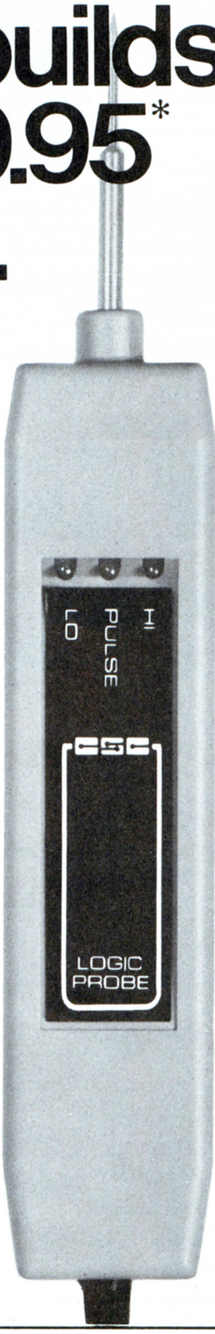
Jerome Ray Briant
9727 Winter Gardens Blvd., #102
Lakeside, CA 92040

Guess who builds this great $19.95* Logic Probe.

You. With this easy-to-build Logic Probe Kit from CSC and just a few hours of easy assembly—thanks to our very descriptive step-by-step manual—you have a full performance logic probe. With it, the logic level in a digital circuit translates into light from the Hi or Lo LED; pulses as narrow as 300 nanoseconds are stretched into blinks of the Pulse LED, triggered from either leading edge. You'll be able to probe deeper into logic with the LPK-1, one of the smarter tools from CSC.



Complete, easy-to-follow instructions help make this a one-night project.



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CIRCLE INQUIRY NO. 6

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only $985
MINI DOT PRINTER MODEL
CHARACTER SPEED 125 CH/SEC
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The Japanese import which brings you the same high standard of technology and quality you've come to expect from Japan.

OUTSTANDING FEATURES

- 80-column, bi-directional dot matrix impact printer with numerous features found only in higher priced models . . . but at far lower cost—only $985 in single quantities.*
- Especially developed for continuous duty performance at 125 cps, our precision engineered print head is unmatched by anything else in its class, with quality and durability that assures you of a long print life.
- Adjustable sprocket feed mechanism allows you to use forms from 4½" to 9½" wide.
- Full 96 ASCII set lets you print upper and lower case characters which can be expanded for double-width fonts in bold face.
- The VFU (Vertical Format Unit) gives you preprogrammed/programmable tab positions, Top of Form and Bottom of Form.
- Ease of connection—Centronics compatible, parallel interfacing makes it possible to use directly with computers like Apple, TRS-80, Sorcerer, or any standard computer with parallel interface. And our RS232/TTY interface will soon be announced.
- Quiet operation—Our workhorse is ideal for office, industry, classroom and home.
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SPECIFICATIONS (Just the highlights)

- 5x7 dot matrix
- 125 CPS
- 60 lines per min.
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- Bi-directional
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- Form thickness original plus 3 copies.
- Centronics compatible parallel interface.
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If you've been wary of the stalls and failures of other small printers, you'll be delighted with the uninterupted service from our workhorse. We back it up with a 90-day warranty on parts and labor. *And we allow generous discounts to quantity OEM buyers.

Order now by phone, or send us this order form today.

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CIRCLE INQUIRY NO. 49

"My 8 to 5 minifloppy™ now works nights and weekends."

RECHECK MONDAYS P.O. #
MEETING AT 11:30 TODAY!

"I own a fast-growing business and before I bought my computer system I put in a lot of late hours keeping up with my accounting and inventory control. Now the computer does my number crunching quickly, so I have time after hours to have some fun with the system. My son and I started out playing Star Trek on the system, and now we're learning to play chess.

"When I was shopping around for my system, the guys in the computer stores demonstrated all the unique features of the minifloppy. I've got to admit that at first I didn't really understand all the technical details. But now that I use the system every day, I really appreciate the minifloppy's fast random access and data transfer. I like the reliability, too.

"I'm glad I went with Shugart drives. Look, when you lay out your own money for a system, you want dependable performance and good value. Do what I did. Ask for the system with the minifloppy."

If it isn't Shugart, it isn't minifloppy.

Shugart
435 Oakmead Parkway, Sunnyvale, California 94086

See opposite page for list of manufacturers featuring Shugart's minifloppy in their systems.

TM minifloppy is a registered trademark of Shugart Associates

ARIZONA FRAUD

An official of World Power Systems, Inc. has been arrested and the founder and his wife are being sought for suspicion of conspiracy and fraud, according to Pima County Attorney spokesmen.

The Tucson, Arizona, company placed ads for computer and electronic equipment in several magazines and got equipment from a variety of manufacturers by using fraudulent credit reports, officials said. An estimated $100,000 to $250,000 of equipment was confiscated following the arrest of George Perry Pollock, alleged to be one of the executives of the firm.

Officials are seeking Norman Hunt and his wife, who were using the names Jim and Lee Anderson while acting as the founders of World Power. They are thought to be the same persons who perpetrated another fraud of the same type while using the name Colonel Winthrop and the company name DataSync.

Bank funds which remained after the couple fled are being held by police. Persons who ordered prepaid equipment from the company or have any information on the whereabouts of the couple are asked to contact Susan Moore, Pima County Attorney's office, 900 County Courts Blvd., 111 W. Congress, Tucson, AZ 85701.

MODEM OKAYED BY GTE

Gandalf Data, Inc., a Wheeling, Illinois manufacturer of modems and private automatic computer exchange systems announces that the GTE Service Corporation has completed its evaluation of the Gandalf LDS 120D/3120D modem and LDS 140D/3140D.

All GTE operating telephone companies are being notified formally in a product standardization bulletin that the LDS 120D/3120D and LDS 140D/3140D units are designated as GTE standard. The units are used by common carriers and end users who transmit computer data over limited distance computer telephone lines.

Gandalf Data, Inc. manufactures in the U.S. under license from Gandalf Data Communications, Ltd., who has a U.S. and Canadian patent covering the technology.

NEWSLETTER FROM HARVARD

There is the Harvard Business Review and the Harvard Medical Letter, among other Harvard University periodicals. And now, starting this month, there will be The Harvard Newsletter on Computer Graphics.

The semi-monthly newsletter will monitor important commercial, technological, and product developments, as well as market, application, and learning opportunities. Among the regular departments — all of interest to the computer graphics community — will be News and Trends, Products, Markets, Applications, R & D, Conferences and Seminars, Companies, Business and Financial, and State-of-the-Art Technology.

One-year subscription (24 issues) price is $125; 9-issue trial, $45; for airmail outside of North America, add $19.50 or $9.75 for the trial. Makes checks payable to Harvard University and mail to Laboratory for Computer Graphics, 520 Gund Hall, Cambridge, MA 02138.

1ST ANNUAL SOFTWARE SURVEY

According to a recent survey published in the April issue of *Packaged Software Report,* a publication of Management Information Corporation, most users feel that the application software is not up to par with the hardware in their small business computer systems. The worst areas, in the opinion of about 500 respondents, are documentation of the programs and vendor support.

Other findings of this survey include:

- Over 50% of the respondees purchase program packages.
- No one company achieved a rating of 3.0 or greater in all categories. This signifies a certain amount of dissatisfaction on the part of users.
- Although software is still mostly purchased, software rental is increasing.

MICROCOPYING STANDARD ISSUED

An international standard that specifies a method for testing microforms and microrecording equipment has been approved as an American National Standard and is now available from ANSI.

A test pattern and a test chart are provided in the standard to measure the minimum size of detail that can be distinguished on microfilm. Application of the test method by microform producers will enable them to determine the ability of microcopying systems to record fine detail.

Since these systems may be operated close to the limits of legibility, the test provides a safeguard against information loss caused by images of poor quality.

Included in the standard are descriptions of test apparatus and test procedure; dimensions, tolerances, and illustrations of test patterns; and a reproduction of test patterns as they would appear on microfilm.

For more information contact Alice Droogan, ANSI, 1430 Broadway, New York, NY 10018, (212) 354-3320.

BURROUGHS REDACTRON OFFERS PRINTER TO LICENSEES

MAS Systems, Inc., a new technology marketing company formed by Anthony Mauro, formerly marketing vice-president of Redactron Corporation, has been authorized to act on behalf of Burroughs Redactron as its representative to arrange licensing for manufacturing and marketing rights for a new type of "ball" printer. The printer was developed by the Burroughs Redactron engineering staff for its word processors.

The printer operates at a speed of 35 cps and is bidirectional. It is fully developed, and tested, and ready for tooling. Patent applications have been filed.

For information contact MAS Systems, Inc., 10 Sandpiper Lane, East Islip, NY 11730.

Look for Shugart drives in personal computer systems made by these companies.

Altos Computer Systems
2378-B Walsh Avenue
Santa Clara, CA 95050

Apple Computer
10260 Bandley Dr.
Cupertino, CA 95014

Digital Microsystems Inc.
(Formerly Digital Systems)
4448 Piedmont Ave.
Oakland, CA 94611

Imsai Mfg. Corporation
14860 Wicks Blvd.
San Leandro, CA 94577

Industrial Micro Systems
633 West Katella, Suite L
Orange, CA 92667

North Star Computer
2547 9th Street
Berkeley, CA 94710

Percom Data
318 Barnes
Garland, TX 75042

Polymorphic Systems
460 Ward Dr.
Santa Barbara, CA 93111

Problem Solver Systems
20834 Lassen Street
Chatsworth, CA 91311

Processor Applications Limited
2801 E. Valley View Avenue
West Covina, CA 91792

SD Sales
3401 W. Kingsley
Garland, TX 75040

Smoke Signal Broadcasting
6304 Yucca
Hollywood, CA 90028

Technico Inc.
9130 Red Branch Road
Columbia, MD 21045

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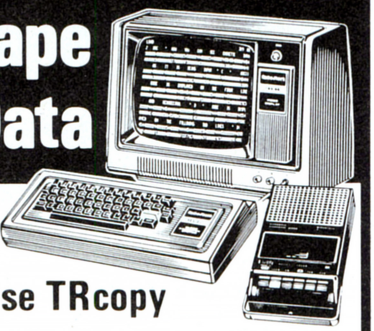
Shugart

See and Copy Tape Data



use TRcopy

WITH YOUR LEVEL II TRS-80*

TRcopy is a cassette tape copying system that lets you SEE what your computer is reading.

COPY ANY CASSETTE TAPE**

With the TRcopy system you can copy any TRS-80 Level II cassette tape whether it is coded in Basic or in machine language. You can also copy data created by programs and you can copy assembler listings.

YOU CAN SEE THE DATA

As the tape is being loaded, you can SEE the actual data byte-for-byte from the beginning to the end of the program. Up to 320 bytes are displayed at one time. ASCII characters are displayed on the first line and hexadecimal code is displayed on the following two lines. Data is displayed exactly as it is input including memory locations and check sums.

IDENTIFY PROGRAMS

With TRcopy you can identify programs on cassette tapes without written documentation because you can SEE the filename. If you forget to label a tape, you can use TRcopy to display the tape contents and identify the cassette.

VERIFY CASSETTE TAPES

With TRcopy you can verify both the original tape and the tape copies. You can make certain that your machine reads the original tape correctly and that it makes byte-for-byte copies. TRcopy also counts as it reads giving you the exact length of the data.

MAKE BACKUPS FOR YOUR PROGRAMS

Now you can make backup copies of your valuable programs. Many times a cassette that you make will load better than one that is mass produced. The original can then be kept as a backup in case the copy is damaged.

MAKE COPIES OF YOUR SOFTWARE

If you are in the software business you can use TRcopy to make tested copies of your programs for sales distribution. TRcopy produces machine language tapes that are more efficient than those produced by the assembler itself.

RECOVER FAULTY DATA

With TRcopy you can experiment with the volume and level controls and you can SEE what the computer is reading--even if your computer will not read the data through normal read instructions! In this way it is possible to read and copy faulty tapes by adjusting the volume control until you SEE that the data is input properly.

SIMPLE – FASCINATING – FUN

TRcopy is not only a practical utility program. It is also a fascinating graphics program that lets you SEE, for the first time, cassette data as your computer is reading it. And it's as simple as 1-2-3. Just load, verify and copy. You will now be able to use cassette tapes with confidence knowing that TRcopy is there when you need it.

The TRcopy system is a machine language program with documentation explaining tape leaders, sync bytes, check sums and other formatting conventions. With the TRcopy system, you can SEE what you are doing!

TRcopy System Including Cassette Tape and Documentation 39.95 POST PAID

Orders accompanied by money order or cashier's check mailed same day. Orders paid by other check shipped in 14 days. No COD's. Return within 10 days for a full refund if you are not satisfied.

N.D. Orders Add 3% Sales Tax. *TRS-80 is a trademark of the Tandy Corporation. **You cannot copy the TRcopy cassette.

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CALL IN YOUR ORDER Now!

Call Toll-Free 24 Hours

If you have a Master Charge or a Visa credit card, you can call toll-free from the nearest telephone and have your TRcopy system on its way to you today.

Call 1-800-437-4144 anytime – 24 hours a day.

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NOW USE TRCOPY WITH YOUR PRINTER

Included at no extra cost – Now you can use the TRcopy system to output tape data to a line printer or a quick printer. The data is printed exactly as it is input from the tape including file names, memory locations and check sums. A printed copy can be especially helpful in the analysis or recovery of records contained in tape data files.

ORDER YOUR TRCOPY SYSTEM NOW!

TOLL FREE 24 Hours SAME DAY SHIPMENT

CIRCLE INQUIRY NO. 13

the Column

By John McCallum

THE ALTAIR 680 BUS STRUCTURE

The 680 bus can be divided into five groups of lines: address, data, power, timing and control and spares.

Address Lines

The 16 address lines address up to 65,536 bytes of memory (or I/O devices since I/O is memory mapped). The address lines are:

A0 - PIN 71 (low order bit)	A8 - PIN 53
A1 - PIN 19	A9 - PIN 7
A2 - PIN 17	A10 - PIN 3
A3 - PIN 15	A11 - PIN 4
A4 - PIN 23	A12 - PIN 25
A5 - PIN 12	A13 - PIN 56
A6 - PIN 11	A14 - PIN 30
A7 - PIN 9	A15 - PIN 32 (high order bit)

The address lines are fed directly from the M6800 MPU chip without buffering. The MPU will drive one TTL load at up to 1 MHz with 130pf of capacitance. This will drive about 7-10 Motorola MPU family chips or low power TTL chips. The 680 system already drives 3-4 devices each, plus the bus capacitance so that no more than about 5 addressed devices or boards should be added to the system. The address lines are tied high to +5V by 4.7KΩ resistors so that the lines will float high when the bus is tristated.

The address bus can also be used by external devices for DMA transfers when the bus is in its tristated mode (when BA is high). The addresses F000 and F001 are the on-board serial input/output interface command/status and data registers. F002 addresses a set of hardware jumpers used to determine terminal usage specifications.

The on-board EPROM is addressed for locations FC00 to FFFF with the supplied 680 monitor occupying FF00 to FFFF and using RAM locations from 0000 to 00FF (00F2 to 00FF are reserved words, and the low order bytes are for stack usage). The on-board 1K RAM is re-addressable to any 1K boundary. The result when two devices such as memory or an I/O device are located at the same location is indeterminant so that you have to avoid addressing any memory to cover any of the above fixed addresses or the peripheral addresses. In simpler terms, you do not use addresses F000 to FFFF.

Data Lines

The 680 bus has an 8-bit data bus that is separated into 2 bidirectional groups: a direct data group and a buffered data group. The data lines connected directly to the MPU are:

D0 - PIN 47 (low order bit)	D4 - PIN 41
D1 - PIN 46	D5 - PIN 39
D2 - PIN 95	D6 - PIN 37
D3 - PIN 35	D7 - PIN 34 (high order bit)

These lines are used to examine or deposit data from the front panel. The front panel can also be used to read from or write into an I/O device (a highly useful hardware debugging feature). The buffered data lines are connected to the MPU through 74367 tristate buffers capable of driving up to 20 standard or 200 low power TTL devices. The buffered data lines are:

THE $798* INTERTUBE II®

INTERTEC DATA SYSTEMS
INTERTUBE

It's already a big success!

The party's over for all dumb terminals and a lot of smart ones too. But, at $798 (quantity 25), the party's just beginning for Intertec's InterTube II.

Standard features to celebrate include a full 24 line by 80 character display, 128 upper and lower case ASCII characters, reverse video, complete cursor addressing and control, an 18 key numeric keypad, special function keys, blinking, protected fields, character and line insert/delete, editing, eleven special graphics symbols, a 25th status line which displays the terminal operating mode and an RS-232 printer port.

You'll discover even more reasons to celebrate when you sit down in front of an InterTube II. Our wide bandwidth monitor produces crisp, sharp chararters everywhere on the screen. InterTube's Z-80 processor enables a host of operator oriented features to boost the efficiency of both software and programmers. And, InterTube's rugged modular design combined with its built-in self-test mode insures quick and reliable servicing.

InterTube's price/performance ratio can satisfy your requirements whether they be a sophisticated data entry application or a simple inquiry/response environment. So, there's really no reason to think "dumb" when you can afford to be so smart!

Join the thousands of InterTube celebrations going on around the country at this very moment. Call us at the number below and start your own celebration (BYOB—we'll bring the InterTube).

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CIRCLE INQUIRY NO. 25

4 New Boards & the SDS-200 join State-of-the-Art SD Technology

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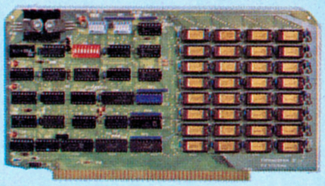

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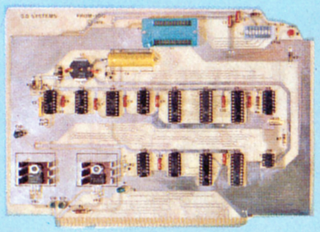

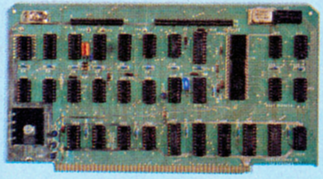

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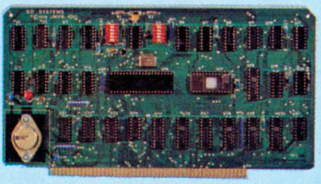

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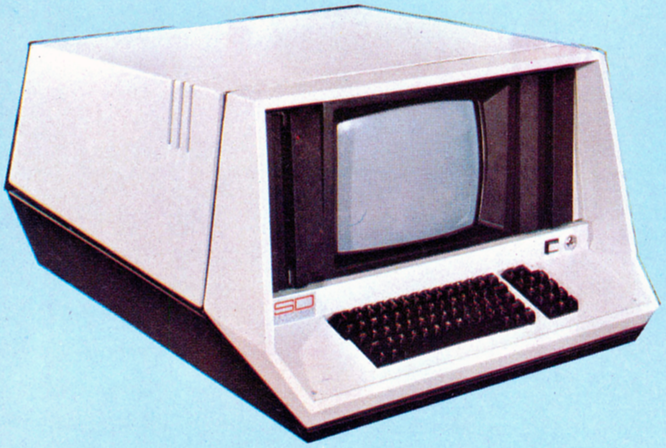

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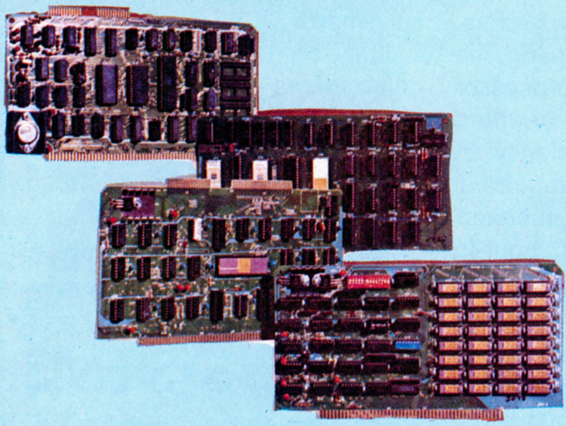

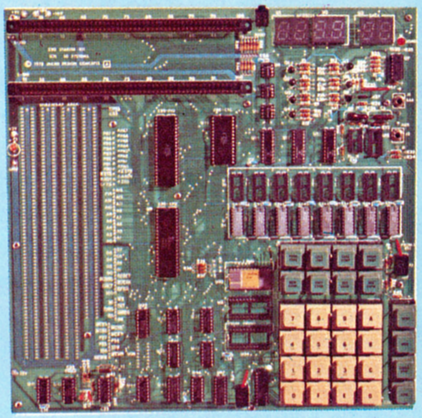

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BD0 - PIN 27
BD1 - PIN 28
BD2 - PIN 31
BD3 - PIN 81
BD4 - PIN 90
BD5 - PIN 42
BD6 - PIN 43
BD7 - PIN 44

The buffered data lines are used for transferring memory and I/O data. Unfortunately the 1702 EPROMs are connected directly to the BD bus. The 1702s have a drive capacity of 1 standard TTL load, the same as the 6800 MPU. The onboard RAM connects using 74LS01s which limits their use to 5 standard TTL loads. This means that the power of using the 74367 high power buffers is effectively lost. More simply, the address and data lines along the 680 bus will support only about 5 boards, each with a single lower power TTL circuit connected. Conversely, it means that any type of TTL compatible device can be used to put data onto the bus instead of requiring high power drivers (74367 or 8T97 type) such as are used most frequently in (S-100) bus designs. Using 74LS367 drivers will result in saving about ½ amp at +5 volts.

Power Supply Lines

The power available on the 680 bus is fairly small in keeping with its design philosophy. Five voltages are available on the bus. The supply lines are:

+ 5V - PINS 1 and 51
+ 9V - PIN 13
+16V - PIN 76
GROUND - PINS 50 and 100
− 9V - PIN 26
−16V - PIN 72

Using 74LS367 drivers will result in saving about ½ amp at 15 volts.

No AC sources are available on the bus, and the line voltage is completely isolated. The roughly estimated power supply available and the usage of these supplies is shown below.

voltage	form	total supply available	used main board	used front panel
+ 5V	regulated	1500 ma	1000 ma	100 ma
+ 9V	unregulated	3000 ma	none	none
+16V	unregulated	1000 ma	20 ma	none
− 9V	regulated	500 ma	180 ma	none
−16V	unregulated	500 ma	35 ma	none

The 680 is usually wired with a second transformer when the expanded board and other boards such as the 16K memory board are added. Each board added should have on board regulation using the more powerful unregulated supplies. The power supply should provide power for a full system if the boards are reasonable in power demand.

Timing and Control Lines

The remaining lines used in the 680 bus are for timing and control. The clock lines are:

01 CLOCK - PIN 16 (500 KHz)
02 CLOCK - PIN 57 (500 KHz)
2MHz CLOCK - PIN 49
DBE - PIN 29

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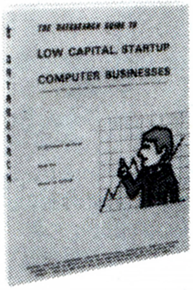

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where 01 and 02 are a 500 KHz asymmetric, two-phase non-overlapping 5V clock. 01 is for internal operations while 02 is used for data transfer. The system uses a crystal controlled 2MHz clock which is also available on the bus.

DBE is normally an input signal data bus enable which disables the MPU data bus internally. In the 680b it is connected directly to 02 at the MPU. 01 and 02 are buffered by 4050 CMOS drivers to provide drive capability of 2 standard TTL loads. The 2MHz clock is driven by a 74LS04 capable of driving about 4 additional standard TTL loads. DBE should not be used as a driver (for 02) but probably has more drive capability than 02.

The data transfer control signals on the bus are:

R/$\overline{\text{W}}$ - PIN 5
VMA - PIN 98
R/$\overline{\text{W-P}}$ - PIN 14

The 680 bus does not need the large number of signals that are used on the S-100 bus since the M6800 MPU uses memory mapped I/O (each input or output port is treated as location in memory) instead of input or output instructions.

The R/$\overline{\text{W}}$ signal is used to give the direction of the data transfer. It is either high for transfer from memory to the MPU (a read) or low for a transfer from the MPU to the memory (a write).

The R/$\overline{\text{W-P}}$ is used to signal the data transfer to take place (R/$\overline{\text{W-P}}$ is the nand of R/$\overline{\text{W}}$ and 02). In the case of writing into memory, the R/$\overline{\text{W-P}}$ will go low when a write is to occur. At all other times R/$\overline{\text{W-P}}$ will stay high. The read cycle of data transfers is not critical since it is arbitrated by the internal MPU databus enable. (You can use VMA•02 to give a read pulse for controlling external memory reads or device reads.)

The VMA signal is used to indicate a Valid Memory Address on the bus for addressing memory or I/O devices. The VMA signal will be high for over half (about 700 ns) of the 01 cycle (1000 ns) on the 680 bus. This is used to cut the addressing set-up time for memory or peripheral devices, with the 02 signal used for the actual read transfers.

Direct Memory Access can be accomplished on the 680 bus by two techniques: cycle stealing or by halting the processor for block transfers. The block transfer DMA uses the following lines:

$\overline{\text{HALT}}$ - PIN 63 ($\overline{\text{HALT}}$ OR $\overline{\text{DMA REQUEST}}$)
BA - PIN 97 (BUS AVAILABLE OR DMA GRANT)

To request the bus, the DMA controller should poll the HALT line to ensure that it is high (no other device is using the DMA). Then when DMA is available, pull the HALT line low. When the MPU grants the DMA, the BA line will go high indicating that the address, data, and R/W lines have been floated and the lines are available for DMA (this takes about 4 μsec on the 680). The VMA signal is forced low to protect memory from false writes but can be wired ORed so that effectively it is floated as well. The front panel uses this technique to examine and deposit into memory. Raising the $\overline{\text{HALT}}$ line returns the processor to normal execution.

The cycle-stealing DMA control makes use of:

$\overline{\text{TSC}}$ - PIN 33

When the tristate control (TSC) is forced high, the address bus, databus and R/W are floated, the VMA is forced low, 01 is forced high and 02 is forced low. This floating requires 500 μsec which allows up to 2500 ns for a DMA controlled transfer. TSC can be held high only for 3 μsec due to the M6800 internal register refresh mechanism. The clock signal (2 MHz) can be used to control the data transfers. Any memory or device (i.e. on board ACIA, RAM, ROM) requiring a 02 signal will be unavailable for use during a cycle stealing DMA.

Interrupts allowed are of 4 types, 3 controlled by bus lines:

$\overline{\text{RES}}$ - PIN 54
$\overline{\text{IRQ}}$ - PIN 96
$\overline{\text{NMI}}$ - PIN 24

The interrupts are vectored in order RES, NMI, SWI (software interrupt) and IRQ. Reset ($\overline{\text{RES}}$) going low then high interrupts on the

Summary of Interrupt Behavior

	Interrupt while Instruction in progress	Stack present MPU status	Check	Set	Location of interrupt handler ($PC_{H,L}$)	Monitor traps to	
			Interrupt Mask I_m			ACIA	baudot
RES	yes	no	no	yes	FFFE, FFFF	FF08	FFCC
NMI	no	yes	no	yes	FFFC, FFFD	0104	0104
SWI	no	yes	no	yes	FFFA, FFFB	FFEE	FF04
IRQ	no	yes	yes	yes	FFF8, FFF9	0100	FE00

positive going edge. It loads the address of its interrupt handling routine from location FFFF and FFFE, then transfers there. The non-maskable interrupt occurs when the NMI line goes low. Like the software interrupt, it stores the MPU status, sets the interrupt mask and loads its handler address into the $PC_{H,L}$.

The $\overline{IRQ}$ going low requests an interrupt. The interrupt is granted if the interrupt mask (I_m) is not set. The interrupt mask is manipulated by all interrupts and by the software instructions, SWI, RTI, CLI, SEI. The interrupt is normally cleared on the end of the interrupt handler by a return from interrupt (RTI) instruction which restores the MPU status.

The Altair 680b uses only the RES and SWI for the standard monitor IRQ traps to location 0100H and NMI to location 0104H. The baudot version of the monitor uses the IRS, RES and SWI interrupts, leaving the NMI to trap to location 0104H. The monitor address for the traps can be changed by replacing the monitor ROM located at FF00-FFFF (FE00-FFFF for baudot version).

Spare Bus Lines

The following 47 bus lines have no assignments:

2,6,8,10,18,20,21,22,36,38,40,45,48
52,55,58,59,60,61,62,64,65,66,67,68,69,70
73,74,75,77,78,79,80,82,83,84,85,86,87
88,89,91,92,93,94,99

SUMMARY

The Altair 680 bus was designed for a small personal computer. The bus has a very limited drive capability of about 1 standard TTL load. The length of the bus is limited not only physically by the chassis but also by the length of bus lines that can be connected directly to the processor. Any physical extension of the mother board would increase the drive capacitance past its limit.

Boards designed to interface with the Altair 680 bus should be designed for minimal power consumption, and for minimum input drain on the bus address lines.☐

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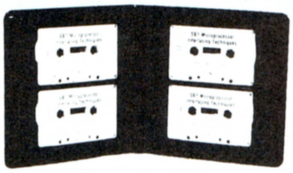

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The federal law defines a trademark as "any word, name, symbol, or device or any combination thereof adopted and used by a manufacturer or merchant to identify his goods and distinguish them from those manufactured or sold by others." The federal law also defines a service mark as "a mark used in the sale or advertising of services to identify the services of one person and distinguish them from the services of others."

Trademarks can and often do become indelibly identified by the public with the source of the product or service and serve the public as a reliable indication of a consistent level of quality even when the name of the trademark owner is not commonly known.

For example, NAKED MINI, SCOTCHFLEX, EXORCISER and MICROFLOPPY, (trademarks of Computer Automation, Inc., 3-M Company, Motorola, Inc., and Pertec Computer Corporation, respectively) may be well known and linked in the public mind with high quality products even by those who have no idea who actually owns each such trademark. Thus trademarks often become goodwill-related assets that can be very valuable, especially with extensive advertising and long periods of use that strengthen the link between the trademark and the product or service.

Unlike the federal laws related to patents and copyrights, the trademark laws are both state and federal. Thus, there are fifty-one sets of trademark laws in the United States. Also unlike patent rights, trademark rights are generated upon use of the trademark in conjunction with the product or service.

In fact, use of a trademark is a prerequisite to its registration. Consequently, one cannot reserve a trademark by registering it for later use.

After a trademark owner has begun using the mark to denote the source of his goods or services, common law protection adheres to the mark in a limited geographical area depending upon where his use of the mark actually occurred. He may, in effect, extend his geographical area of protection to the borders of his state, or of any state, by registering his trademark, usually with the Secretary of State's Office, as long as he has first used the mark in each such state.

Registration may be denied if someone else already has registered a similar trademark with which the mark sought to be registered might be confused, or cause mistake or deception by the public. Even if registered, the trademark will not defeat prior common law rights in trademarks of others.

If the trademark owner has used his trademark in either interstate or foreign commerce he may then extend his rights nationwide by registering in the United States Patent and Trademark Office in

Washington, D.C. If the federal trademark examiner doesn't find any federally registered trademark that he believes would be likely to cause public confusion with the mark sought to be registered, he then has the latter trademark published in the Trademark Official Gazette. Anyone who believes that he will be damaged by registration of that trademark may then oppose its registration in a court-like proceeding.

Federal registration of a trademark on the Principal Register provides certain advantages in addition to nationwide protection. It permits the trademark owner access to federal court jurisdiction and the possibility of recovering treble damages if he prevails. It constitutes constructive notice of ownership of the registered trademark, thereby precluding a defense of good faith adoption of the mark by another. The owner of a trademark registered on the Principal Register may block the importation into the United States of goods bearing an infringing trademark.

Only with those trademarks registered in the United States Patent and Trademark Office can the symbol ® be used to provide constructive notice of such registration. Constructive notice of federal registration by that symbol or by other notices prescribed by a statute, or actual notice of registration by direct communication, is a prerequisite to recovery of profits or money damages.

The trademark owner may, to the extent of his geographical boundaries of protection, exclude others from using trademarks that are likely to cause confusion as to the source of the products or services. In more limited circumstances where the mark is well known and highly distinctive or has strong secondary meaning, the owner may exclude others from using trademarks that are likely to dilute the distinctive quality of his trademark even when the respective goods are grossly dissimilar.

The more distinctive trademarks stand a better chance of becoming strong and thus achieve a greater degree of protection. Perhaps the most distinctive trademarks are those that have no particular meaning other than serving as a trademark. Such "fanciful" marks as KODAK, POLAROID, and XEROX have, as a result of extensive advertising and long use, become very strong trademarks that the courts have been quick to protect from confusingly similar marks used on related goods and from dilution that might result from their use on even totally unrelated goods.

However, fanciful trademarks, particularly those that are very strongly linked to a particular product line, run the risk of becoming generic; that is, a generic name of a product or process performed by the product. Because generic terms cannot be protected as valid trademarks, the risk is that such trademarks will fall into the public domain. Examples of former trademarks now in the public domain include Aspirin and Cellophane.

This risk that the very popularity of a word symbol may contain the seeds of its own destruction as a valid trademark is particularly high when the product is new and unfamiliar and no traditional generic name for the product exists. Sometimes continued extensive advertising and exclusive use on a wide variety of products can, in effect, recapture a formerly generic trademark from the public domain. The Singer Sewing Machine Company has apparently achieved such recapture, but it took fifty-eight years from the time the U.S. Supreme Court ruled "SINGER" to be generic for a certain class of sewing machines, until a federal court of appeals proclaimed the enforceability of that trademark.

This brings us back to Xerox. Whether the trademark XEROX has actually become generic, and whether the Xerox Corporation's advertising campaign is having the intended effect, remain for a court to decide. However, now you will understand the purpose of such ads and the serious problem with which Xerox Corporation is faced. Next month the discussion of trademarks will include considerations in selecting and registering a trademark.☐

The material presented in this column is intended for the reader's general information. The author requests that the reader consult professional advisors prior to applying this material to his or her specific situation. Anyone seeking further information may contact the author at the Law Firm of Fischer and Tachner, 2192 Dupont Drive, Suite 210, Irvine, CA 92715.

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CIRCLE INQUIRY NO. 37

FROM THE FOUNTAINHEAD

By Adam Osborne

Osborne & Associates is now a division of the McGraw-Hill Book Company. In making the decision to sell my company to McGraw-Hill, I have simply taken the advice which, for the past year, I have been offering others.

Osborne & Associates published *An Introduction to Microcomputers* in December of 1975. It was the world's first book on microprocessors. Frankly, we had no idea what we were getting into. At the time, we were a small consulting company. We expected to generate most of our revenues providing microprocessor related consulting services; our book *An Introduction to Microcomputers* was supposed to help our consulting business, and perhaps generate a little useful income.

But that is not how things turned out. The book was very well received, and we quickly redirected our efforts toward publishing additional microprocessor related books. Just over three years later we have 14 books available, with almost as many new books in various stages of production.

I decided the time was right to enter this acquisition because of Osborne & Associates' growth, and the growth of the microcomputer industry in general. Our growth has introduced new management problems, and new financial needs. With no prior experience, we have had to learn and compete.

Publishing is an expensive and complex business, and I believe we have reached the point where our continued growth depends on our receiving a helping hand. The time to negotiate an acquisition is while you are still doing very well, before you reach the size where a lack of cash and management experience inevitably starts leading to expensive mistakes.

A number of publishing companies expressed an interest in acquiring Osborne & Associates. We liked McGraw-Hill because they are a rich and well managed company, whose reputation for ethical conduct and quality product is impeccable.

In my actions there is a message for all microcomputer industry manufacturers.

The story of Osborne & Associates is by no means unique within the microcomputer industry. In fact most hardware manufacturers grew much faster than we did. But they have not come to terms with their own changes, and the changing times. Methods of operation which were viable in 1976 and 1977 ceased to be viable in 1978, and will lead many companies into bankruptcy in 1979.

Too many manufacturers are assuming that the huge growth rates which they experienced in their early days will persist now that they are reaching maturity. The reality is that we already have an oversupply of hardware manufacturers, and some must go. Radio Shack and Commodore have "soaked up" a great deal of the growth in the microcomputer market; so has Apple Computer Corporation, the one "new" company with excellent management and finances.

Already we have seen PolyMorphic Systems and IMSAI fall by the wayside. In the next 12 months I predict further casualties. The majority of microcomputer manufacturers are no longer experiencing any growth in sales. For many of these companies, there is no longer any way out. When they were doing well, they spurned investment capital because they were certain the good days would last forever. And now that they are stumbling, the investors are no longer interested.

It is time to update readers on new developments in **the semiconductor industry.**

Zilog finally has a few working Z8002 chips. These parts have not yet been tested thoroughly enough to guarantee that they are completely free of defects, so you had best not expect to get your hands on any Z8002s for another 3 to 6 months. In all probability, the Z8002 will not be available in volume until very late in 1979.

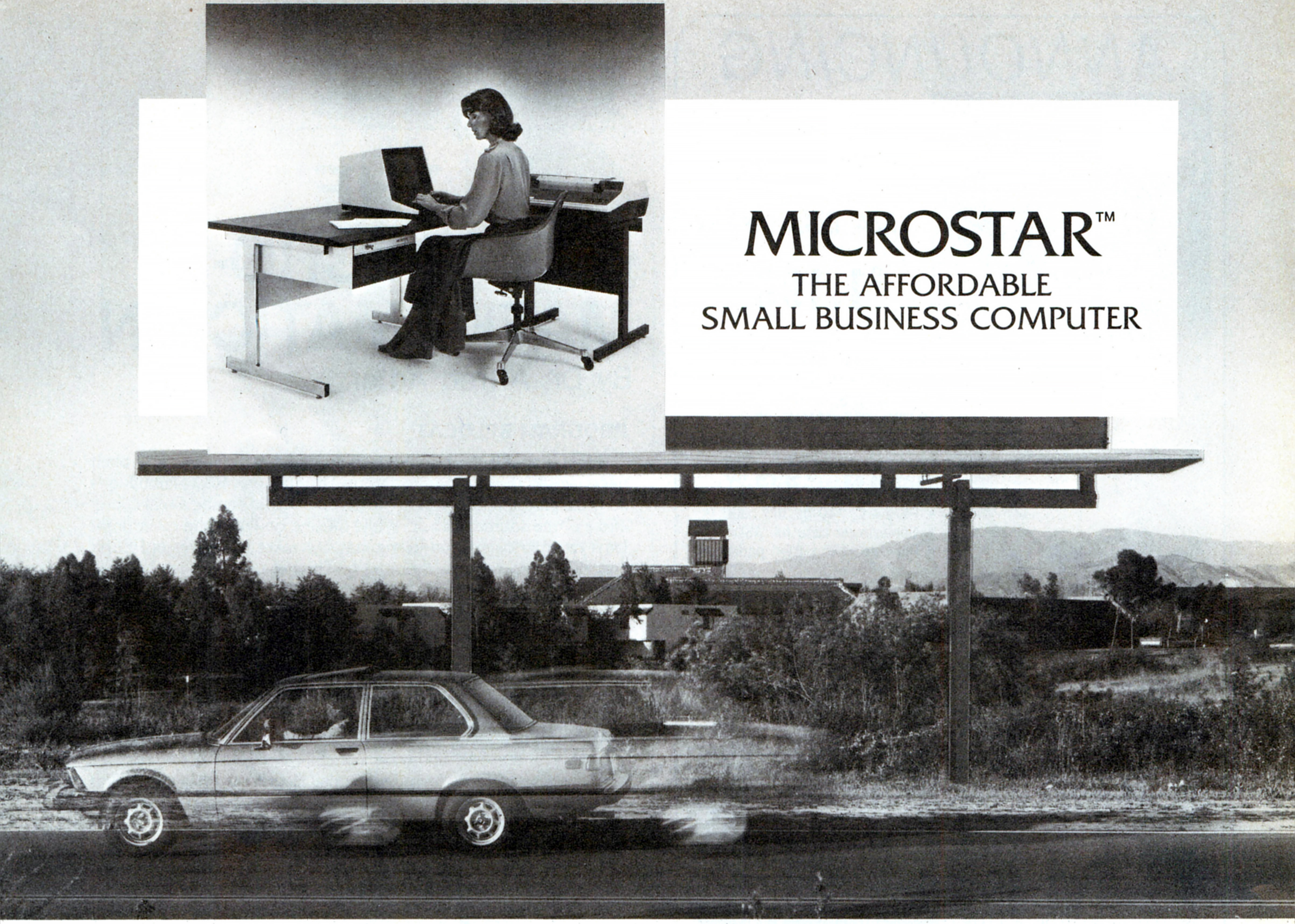
There are two versions of Zilog's Z8000: the Z8002, which is packaged as a 40-pin DIP and addresses 65536 bytes of external memory, and the Z8001, which is packaged as a 48-pin DIP and addresses 8 million bytes of memory. The Z8001 is unlikely to be available until some time in 1980. But that in itself is an astonishing achievement when you consider what the Z8001 can do. I wish the semiconductor manufacturers would quit trying to kid us with optimistic delivery dates for new parts. No one is kidded anymore.

I am always happy to report on **"good guys,"** so you should know that Ithaca Audio has certainly been doing a lot of things right recently. I doubt if I have ever had so many unsolicited testimonials of praise for one company. What is particularly impressive is the fact that few people ever bother to write when they are pleased, they only write when they are angry. Yet a number of Ithaca Audio customers have been so pleased with the superb treatment they have received that they have taken the time to write and tell me about it.

Mr. Al Baker of Wheaton, Illinois, for example, wrote to praise Ithaca Audio for the superb service and cooperation he received after buying one of their TRS-80 expansion interface boxes. It appears that there were some problems attaching this expansion interface box to a Radio Shack TRS-80. The problem was in the TRS-80, yet all the help came from Ithaca Audio.

Ithaca Audio does business through the mail, and they sell through stores. It would appear that theirs is name you can count on.☐

The author can be contacted at Osborne & Associates, P.O. Box 2036, Berkeley, California 94702.



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- 10, 12, 13.2, 16.5 characters /inch
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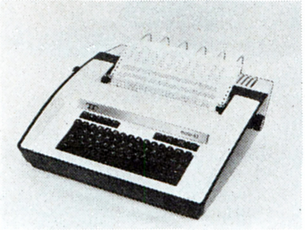

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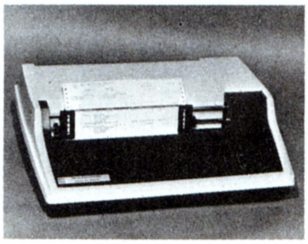

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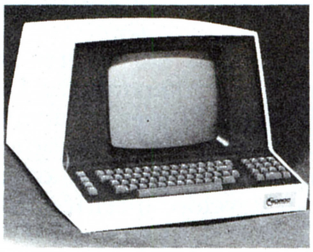

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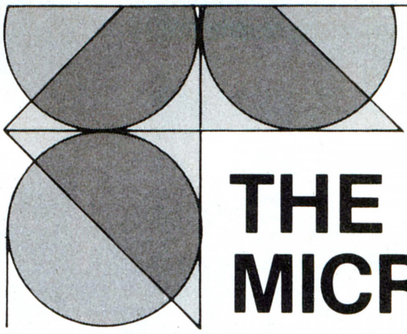

THE MICRO-MATHEMATICIAN

By Dr. Alfred Adler

PROGRAM RELOCAT

While working the bugs out of new system software, it is often necessary to move programs around in memory. Reassembling is no great problem, but keying the new version in can be a real chore, and a prime source of error. While musing on these and other problems recently it occurred to me that all it takes is a series of PEEKs and POKEs to relocate a program. This, of course, does not take care of the changes in addressing within the program itself. However, since address relocations are commonly made in multiples of 256, the small amount of rekeying required probably doesn't justify the considerable added complication of making the program identify and revise the internal addresses. (It isn't the revising so much as the identifying that adds the complication.)

Program RELOCAT, written in PolyMorphic BASIC, Version A00, is able to relocate a program from any of the 64K addresses, to any other of the 64K addresses (whether occupied by memory or not). It is also perfectly happy to overlay BASIC, the program being relocated, itself, the print driver, or anything else so unfortunate as to get in its way. It has no brains; use with caution!

RELOCAT is able to relocate a program from any of the 64K addresses.

The heart of program RELOCAT is in statement numbers 50 to 70 if the program is being relocated to a lower number address, and in statement numbers 80 to 95 if the program is being shifted upward. Note that it is possible to relocate a program as little as one address location upward or downward, since if the program is to be moved downward, the PEEKs are made from the bottom up (see statement number 50), but if the program is to be shifted upward, the PEEKs are peeled off the top (see statement number 80). This prevents the program from overlaying itself.

The remainder of the program is mostly housekeeping. The subroutine between statement numbers 150 and 180 convert the HEX locations entered by the operator into decimal to satisfy the needs of PEEK. The statements between numbers 200 and 235 convert decimal to HEX so the program can report back to the operator regarding the new location.

In use, the operator will be asked to state where the program to be relocated starts, in HEX. He will then be asked where it ends, and where the new location will start, all in HEX. The program will report back to where the new location will end. When the relocation is completed, a report will be made along with a reiteration of the old and new starting and ending addresses. Sample runs, relocating both upward and downward, are presented in the following listing.☐

Alfred Adler can be contacted at 10360 Flintlock Trail, Tucson, Arizona 85715.

PROGRAM LISTING

```
>LIST
1 REM+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
2 REM
3 REM+++++++++  P  R  O  G  R  A  M    R  E  L  O  C  A  T  +++++++++
4 REM
5 REM+++++++++++++  VERSION  1.0  ++++  DECEMBER  1978  +++++++++++++++
6 REM
7 REM++++++++++  WRITTEN  BY  -  ALFRED  A.  ADLER  PH.D.  ++++++++++++
8 REM
10 REM BE SURE WHEN RELOCATING TO KEEP CLEAR OF PROGRAM BEING
11 REM RELOCATED, THIS PROGRAM, BASIC, THE PRINT DRIVER, ETC.
12 REM
15 INPUT1"THE PROGRAM TO BE RELOCATED STARTS AT ",S$\!" HEX."
16 H$=S$\GOSUB 150
18 S1=D
20 INPUT1"THE PROGRAM TO BE RELOCATED ENDS AT ",E$\!" HEX."
21 H$=E$\GOSUB 150
23 E1=D
25 INPUT1"MOVE PROGRAM TO NEW LOCATION STARTING AT ",I$\!" HEX."
26 H$=I$\GOSUB 150
28 I1=D\R=S1-I1
30 N(1)=I1+E1-S1\GOSUB 200
35 !"NEW PROGRAM LOCATION WILL END AT ",F$,\!" HEX."
40 IF R<0 THEN 80
50 FOR J=S1 TO E1
60 P=PEEK(J)
65 POKE J-R,P
70 NEXT
75 GOTO 250
80 FOR J=E1 TO S1 STEP -1
85 P=PEEK(J)
90 POKE J-R,P
95 NEXT
100 GOTO 250
145 REM CONVERT HEX TO DEC
150 D=0\J=LEN(H$)
155 FOR K=1 TO J
160 M=16^(J-K)
165 H(K)=ASC(H$(K,K))-55
170 IF H(K)=<9 THEN H(K)=H(K)+7
175 D=D+H(K)*M
180 NEXT
185 RETURN
195 REM CONVERT DEC TO HEX
200 F$="    "
201 P$="0123456789"
202 Q$="ABCDEF"
204 FOR K=1 TO 4
205 M=16^(4-K)
210 H(K)=INT(N(K)/M)\N(K+1)=N(K)-H(K)*M
220 A=H(K)-9\B=H(K)+1
225 IF A=>1 THEN F$(K,K)=Q$(A,A)\GOTO 235
230 F$(K,K)=P$(B,B)
235 NEXT
240 RETURN
250 !\!"THE PROGRAM HAS BEEN RELOCATED"
255 !"OLD LOCATION ",S$," TO ",E$
260 !"NEW LOCATION ",I$," TO ",F$
>
>
>RUN

THE PROGRAM TO BE RELOCATED STARTS AT 1000 HEX.
THE PROGRAM TO BE RELOCATED ENDS AT 1166 HEX.
MOVE PROGRAM TO NEW LOCATION STARTING AT 8000 HEX.
NEW PROGRAM LOCATION WILL END AT 8166 HEX.

THE PROGRAM HAS BEEN RELOCATED
OLD LOCATION 1000 TO 1166
NEW LOCATION 8000 TO 8166
>
>
>RUN

THE PROGRAM TO BE RELOCATED STARTS AT 8000 HEX.
THE PROGRAM TO BE RELOCATED ENDS AT 8166 HEX.
MOVE PROGRAM TO NEW LOCATION STARTING AT 7000 HEX.
NEW PROGRAM LOCATION WILL END AT 7166 HEX.

THE PROGRAM HAS BEEN RELOCATED
OLD LOCATION 8000 TO 8166
NEW LOCATION 7000 TO 7166
>
>
```

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CIRCLE INQUIRY NO. 54

MICRO MEDICINE

By Wm. V. Weiss, M.D.
Professional Engineer

I recently visited a company in St. Louis (Milliken Communications Corporation) which is deeply involved in using CAI (Computer-Aided Instruction) techniques in a novel way in Continuing Medical Education. Never before have "personal seminars" been available on individually-owned systems. Although CAI is well known in medical schools on large time-sharing systems, the cost of smaller systems until very recently has precluded its use on microprocessor-based systems. Now all this has changed. Both the present generation of physicians and the graduates to come can expect to use CAI on their own office machines.

For those who are familiar with traditional continuing education systems in medicine (audiotape, slide projectors, and videotape) the CAI system is a welcome supplement to the usual "passive" methods. The interactive dialogue of CAI cannot be matched in its ability to involve the traditionally "passive" learner in a more active role. The previous methods of updating oneself are no longer adequate. The Computer-Based Seminars provide a wide range of subjects for personal use. The production of material is a complicated and time-consuming activity, but the results I believe justify the effort.

The material for the Milliken Medical Seminars is the product of a sophisticated protocol. An Editorial Board of physicians from the Washington University Medical Faculty selects a suitable subject. The Board then chooses a distinguished expert in the field, and this "Guest Author" is asked to produce a tutorial of specific length. The expert must generate material, questions relating to his material, patient management problems if indicated and a host of other pertinent data. He is instructed in a general way as to how most previous materials have been formatted, and this guides his creative effort. After some of the material is complete, the Editorial Board reviews it, and may or may not get back to the author for modification. Once satisfied, the staff at Milliken enters the dialogue into a medium scale computer via an appropriate language.

The computer has been programmed to take the finished dialogue (machine form) and produce a microprocessor compatible form of this dialogue for the selected microprocessor system. Prior to the final diskette producing stage, the editorial board has had an opportunity to try the dialogue on the medium scale machine. The Milliken people selected the Apple II 32K processor with an Apple II disk, and a small video monitor. The final tutorial modules are distributed on "Courseware Diskettes" to one or more members of a "field-testing" panel of physicians for final approval and comments. Any feedback is incorporated into the final version of courseware for distribution to client physicians, medical schools, hospitals, etc. The material is regularly updated as medical advances necessitate.

Why was the Apple selected? The principle reason was overall system reliability and *particularly* disk-drive availability and reliability. According to Milliken personnel, their evaluation to date indicates a better maintenance record for Apple II disks than others surveyed. It is hoped that eventually courseware will run on more than one kind of system, as system independence is desired.

There are a number of different "Seminar" system configurations available. A total system with 30 Courseware modules (from 1 to 3 diskettes per unit) costs about $2,800. As the number of courseware modules purchased drops in number the system package price drops. The system can be leased (3, 6, 12 months or longer) or pur-

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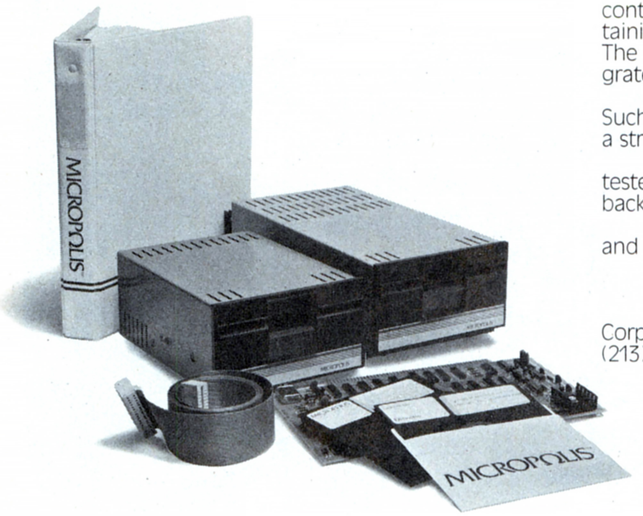

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chased. Courseware diskettes can be purchased individually or in lots without hardware if one already has the appropriate Apple system configuration.

In the actual use of the system (I have had the pleasure) the material is interesting, challenging, and very easy to use. A complete computer novice will have no difficulty using this CAI package. With the Milliken Seminars, the computer keeps track of your performance, challenging the user in areas of weakness, and passing rapidly along if performance is optimal.

If one uses a system shared by other users, some 50 users can be identified and scores compared to other users. The current breakdown of subject material is 30 seminars for Primary Care oriented professionals (Family Physician, Internist, etc.) and 10 plus packages for Specialties.

There is no question in my mind that these CAI "Seminars" represent an important advance in self-administered continuing medical education. One of the attractive aspects of this technique is the possibilities of groups of medical students or physicians working as a group or team in the "interactive" solution of modular "clinical problems." The team might also be multidisciplinary (nurse, pharmacist, social worker, physician, etc.). Thus interprofessional communication can be stimulated.

A valid question is: Does CAI justify its greater cost than alternative learning adjuncts and strategies (books, manuals, slides, audiotapes, video, etc.)? For $2,800 one can buy a lot of instructional materials. Few physicians would spend this much annually on continuing education. Most audio/visual (slide projectors, etc.) programs only run $400-$500 per year. Why not a cheaper medium? If all the package could be used for was medical seminars I would have to say I agree. However, the use of this general purpose machine for other things rationalizes the purchase somewhat more. With mixed video/CAI just around the corner some might want to put off the decision to jump in for a while longer.

Certainly the interactiveness of this technology commends itself as a definite improvement over alternatives. The question is how much more money is it worth? I believe it is worth the difference, and the cost will gradually drop. The future of educational experience for physicians and others will incorporate CAI.

More research in CAI is indicating that in addition to correctness of response, latency of response (time between question presentation and response) is a strong indicator of level of performance. This is an entire subject in itself. The more one examines the role of CAI and the various operational styles, the greater the number of questions arise about the validity of various teaching styles and philosophies. As is often the case when computerization forces a careful analysis of the system one is changing, endless new anxieties arise as to how untested the techniques we are attempting to duplicate actually appear. The emergence of CAI will doubtless provoke continuing controversy over what teachers should do and what machines should do in the educational framework.

In the future we can expect CAI to incorporate "generative principles." Here the system has large informational resources which can be formulated into questions as a result of an initial interrogation of the student to decide how much he knows about a certain subject. This type of system resolves to a considerable degree the "authorship" problem, but it's a bit fanciful for small systems yet.

What is my personal conception of the ideal "learning instrument"? It would have to incorporate video for pictorial display. It should incorporate digital accessing of data from the video medium (probably necessitating videodisc rather than tape technology. The video and alpha/numeric information should be "mixable."

The use of video graphics is essential. In medical activities, the visual aspect is very important, thus multimedia manipulative power is prerequisite for the ideal system. Videodiscs of one hour's duration can provide a vast number of "picture frames" of reference material. It becomes clearer as we ponder the realistic potentials of this medium that educators will become "producers" in the electronic medium around the corner.

We have all been "hyped" with the promise that computers will bring to education, but the reality is now very close at hand and we must consider how it will affect our traditional modes of doing things. Medical education, even the practice of medicine is no more immune to technological change than any other occupation.☐

Dr. Weiss' address is Biolithics, 600 Sherbourne Street, Suite 803, Toronto, Ontario, Canada M4X 1W4.

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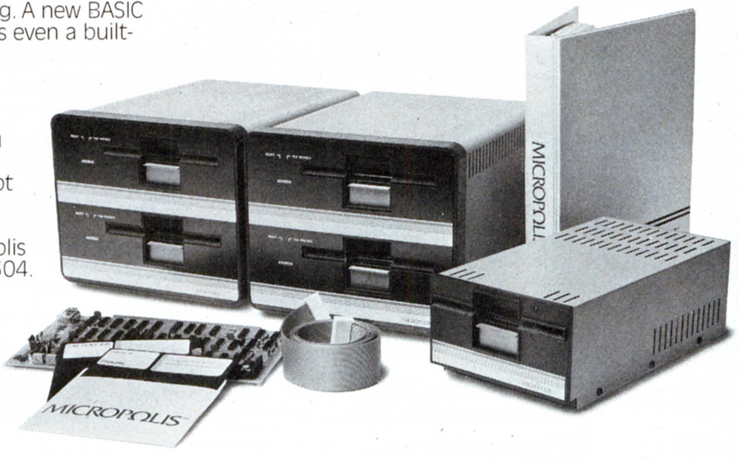

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FORTH Inc., producer of FORTH-based software systems for mini- and microcomputers, has announced a schedule of 13 software seminars to be held throughout the U.S. this summer.

The half-day seminars cover design, application and demonstration of miniFORTH™, microFORTH® and new polyFORTH™ software systems. They are open to programmers, project managers, data processing professionals, electronic engineers, and OEMs.

Seminars will be held in Chicago, July 9; Boston, July 11; Philadelphia, July 13; San Fernando Valley, July 24; Dallas, August 15; Denver, August 17; Seattle, August 23; New York, September 12; Newark, September 13; Washington, D.C., September 14.

For more information contact Stephen M. Hicks, Vice President/Marketing, FORTH, Inc., 815 Manhattan Ave., Manhattan Beach, CA 90266, (213) 372-8493.

ATLANTIC COAST MICRO SHOW

Felsburg Associates, Inc., producers of the Washington D.C., Atlanta, Georgia and Orlando, Florida microcomputer shows, have announced that the first Atlantic Coast Microcomputer Show will be held at the Deauville Hotel in Miami Beach, Florida, July 13-15.

Highlighting the show will be the "Computer Flea Market" which will be an indoor affair adjacent to the main exhibit hall, and the "Do It Yourself" seminars. Both events are open at no extra charge to all exhibitors.

For information contact Felsburg Associates, Inc., P.O. Box 735, 12203 Raritan Lane, Bowie, MD 20715, (301) 262-0305.

COMPUTER GRAPHICS WEEK

Computer mapping and related software, hardware and databases will be the subjects of a week-long international users' conference July 15-20, sponsored by the Harvard University Laboratory for Computer Graphics and Spatial Analysis.

Called Harvard Computer Graphics Week '79, the conference will be held in Cambridge, Massachusetts. The focus of this year's conference will be currently available cartographic and statistical databases, graphics hardware, software, and the electronic communication of geographical information.

For details contact Kathleen Quigley, Center for Management Research, 850 Boylston St., Chestnut Hill, MA 02167, (617) 738-5035.

INTRODUCTION TO DIGITAL ELECTRONICS AND MICROCOMPUTER INTERFACING

This two-week short course will be held July 16-27. It is a hands-on laboratory course for academic and industrial personnel. There will be one microcomputer laboratory station for each two participants. The course entails approximately 60 hours of laboratory instruction.

Reasonable living accommodations including free camping facilities. Tuition is $395. Academic credit is available.

For more information and application forms contact Professor Philip Peters, Department of Physics, Virginia Military Institute, Lexington, VA 24450.

COMPUTER IMAGE PROCESSING

The principles of computer representation of images and computer image processing will be discussed at a course conducted at Rensselaer Polytechnic Institute August 13-17.

The course will introduce the participant to all major facets of computer image processing — mathematical techniques, computer algorithms, hardware systems, software systems, and application areas. Demonstrations will be given during a tour of RPI Image Processing Laboratories.

The fee is $495. For more information contact Mr. Richard J. Teich, Office of Continuing Studies, Rensselaer Polytechnic Institute, Troy, New York 12181, (518) 270-6442.

THIRD NATIONAL SMALL COMPUTER SHOW

The 3rd annual National Small Computer Show will be held at the New York Coliseum August 23-26. NSCS lectures include sessions on system selection, computer languages, word processing and others. Registration is $5 per day, including lectures.

For information write the National Small Computer Show, 110 Charlotte Pl., Englewood Cliffs, NJ 17632.

CONFERENCES ON COMPUTERS AND THE HUMANITIES

Two major international conferences are scheduled at Dartmouth College in 1979. The Fourth International Conference on Computers and the Humanities (ICCH/4) will be held August 20-23. The Conference on Data Bases in the Humanities and Social Sciences will follow on August 24-25.

ICCH/4 is the latest in a series held previously at universities in the United States and Canada. It is sponsored by the Association for Computers and the Humanities.

There will be papers on the application of computers to reserach in language, literature, musicology, history, archaeology, and related disciplines. Selected papers will be printed in "Computers and the Humanities."

For information contact Professor Joseph Raben, Queens College, Flushing, NY 11367, (212) 520-7407, 520-7428.

OHIO HAMFEST

Hamfest '79, sponsored by the Union County Amateur Radio Club, will be held at the Marysville Fairgrounds on August 26. Admission is $1.50 in advance, $2 the day of the exhibits and flea market.

For details contact Chuck Simpson, 1976 Delaware County Line Rd., Marysville, OH 43040 or call on 147.99/39 or 146.52.

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Over the years, I've learned a few things.

For instance, I've learned that the new microcomputers like the TRS-80 are really elegant pieces of hardware. The price is deceiving. Given the right programs, they can jump through hoops.

But finding the right programs isn't all that easy. You can flip through the pages of this magazine and find 50 ads for TRS-80 programs. Granted, a good many of them are for fun and games, but you can still find quite a few offering business programs.

They aren't like mine, though.

Four of these are the genuine Osborne & Associates systems, originally designed for the $30,000 Wang computer. I've made a few minor modifications on them, and now they work on a $4000 TRS-80. The fifth program is one I added myself.

Here's what's on each disk:

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Payroll: it keeps the files, computes pay and deductions, prints forms and checks, figures taxes, overtime and piecework pay, and prints the 941-A and W-2 forms.

AND AN ON-LINE, INTERACTIVE TARANTO PROGRAM

Inventory Control: a custom-tailored program that looks after up to 20 sizes of each of 1300 items—a million items in all. It gives an immediate readout on any item inquiry, including quantity and dollar total.

These programs are marvels of efficiency. They're fully-documented, and you can buy the books locally or from me. On the Osborne programs, my contribution was simply this: I made them work on the TRS-80, and if you buy them from me, I'll make them work for you.

If you're skeptical on that point, call the number below and we'll give you the names of some of the people who've already bought all over the world. Then you can call them up and hear what they have to say.

These programs only cost $99.95 each. (The Cash Journal option on the General Ledger adds another $50.) For that you get the disk, all the instructions you need, and my telephone number. If you call, we answer all your questions and make sure everything's working smoothly. If your question's tough enough, I'll talk to you personally.

Because, as I said, I plan to turn that TRS-80 of yours into a serious computer.

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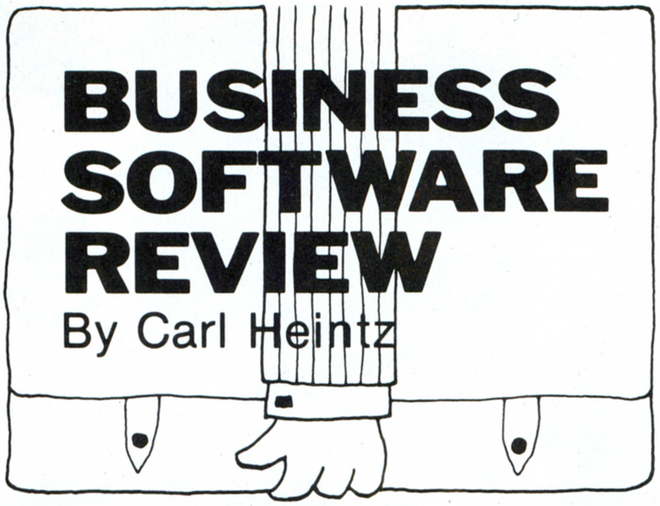


BUSINESS SOFTWARE REVIEW

By Carl Heintz

This month we're going to focus on a neat little set of programs available from Ecosoft, Indianapolis, Indiana. As far as I know the programs are sold only by mail order. The packages reviewed include general ledger and accounts receivable. Other programs available include payroll, a statistics package, and a program designed to keep track of student's grades.

A LOOK IN THE LEDGER

These programs were designed to be run on a North Star disk operating system and North Star BASIC. To use the general ledger accounting package, you need about 11K of free memory, which means that a 32K system would be sufficient with lots of room to spare. Surprisingly enough, the general ledger package does not require a dual disk system — you can run it satisfactorily on one disk. That will require the operator to do some switching of diskettes, but with the prices of drives, it's a thoughtful aspect to the system to allow a one-drive functional set-up.

The accounting package provides for operation with or without printer. My recommendation is not to consider anything in the accounting area without a printer. The program provides for a printer output port assignment made conveniently only once during the program initialization. In those programs where output is available, the user is always given the opportunity of directing the output to the printer or the video monitor. If the monitor option is chosen, the output scrolls, a page at a time, with the return key used to control the output. (If you have never experienced a program flashing by on a non-scrolling, non-stopping system, it's a thrill; the lines fly by so quickly it can be impossible to read.) I found the feature neatly integrated into the package.

The system gives explicit detail which the authors of the program have provided in the form of a manual which literally leads the reader through the program from power-on to entering data. The manual is written in English and can be understood by a non-programmer.

The first step in the process of getting the system up is the data file initialization. After we turned on the system, which in our case consisted of a North Star with 48K, Centronics 779 printer and a Hazeltine 1500 terminal, we initialized a diskette as our data file. With the instructions provided, anyone can do it. The files are set up to handle nominally 100 accounts, and can be easily expanded by making one small change in the initialization procedure to accommodate 200 or more accounts.

The next procedures involve customizing the accounts to reflect the status of the system, which is done with a parameter initialization program. Again, it is easy to use. The parameters which are established are: the drive the data will be on (a one, two or three drive system) the company name, the password, the characteristics of the system (it is possible to have a 32, 64 or 80 character video display, with 16 or 24 lines of video per page). Printer port assignments are made, and the program asks whether a Sol, Soroc, Adam or "other terminal" is to be used. The program then asks how many columns the printer is capable of — which is nice since you have the choice in formatting of using 80 columns or 132.

CHART THE ART

The creation of accounts is a program which uses the names and numbers of accounts to set up a chart of accounts. The program first asks for the date, and then, referring back to something entered in "initialization" states that the user has opted for, say, 38 accounts. The program then asks for the name and numbers of all these accounts.

Now let's focus on what the chart of accounts can be. It used to be that often any old number would do. However, with increasing regulation of business by government, these days it is important to consider the flexibility with which one can structure a chart of accounts. Unfortunately, the vast majority of software packages, Ecosoft included, do not allow one to format the chart of accounts independent of the financial statements. The Ecosoft package uses the following conventions:

Balance Sheet Accounts:	
Current Assets (the authors explain, properly, that these are assets which are expected to be converted into cash within the next year)	1100-1199
Long Term Assets (other than depreciable assets)	1200-1299
Depreciable, Long-term Assets (such as building, equipment and the like)	1300-1399
Other Assets	1400-1499
Current Liabilities	2100-2199
Long-term Liabilities	2200-2299
Owner's Equity	3000-3998
Retained Earnings	3999
Income Statement Accounts:	
Revenues	4100-4199
Adjustments to Revenues (such as sales returns, discounts, etc.)	4200-4399
Cost of Goods Sold (a section of accounts is established here—with a whole range of accounts under the following categories):	
Purchases	7100-7299
Adjustments to Purchases	7300-7499
Selling Expenses	7500-7599
General and Administrative Expenses	7600-7699

Note that these are mandatory account assignments, since the number of an account will determine what will happen to it in the generation of the financial statements. For the vast majority of situations, the authors have provided enough flexibility to satisfy almost all needs of a small business. However, they have forgotten some things which are very useful in a computerized general ledger system including the ability to have *departments* (such as the "Widgit" department, the "Azap" department, the "Printer interface" department). In most small businesses which manufacture items it can be critical to identify the profit or loss generated from each product line or department.

SUMMARIZE THOSE NUMBERS

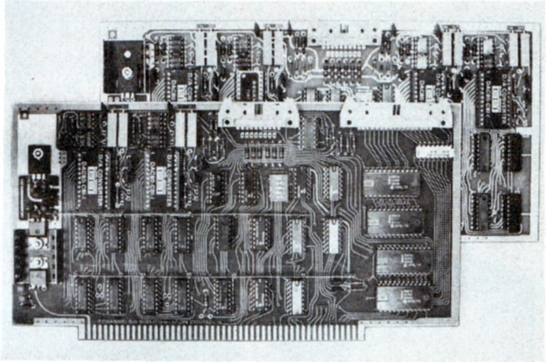
Most programmers don't think like accountants — they are neat, orderly and hate a lot of detail. But once an account-happy accountant is loose with a computerized general ledger system he may set up 2002 accounts for the telephone bill. That would be fine if he wants to code information and keep track of what the boss's portion of the phone bill is, for example. But to have all those accounts print out on the financials may be slightly unreasonable. Some systems allow for this, most of them don't and Ecosoft is one that doesn't. A system which allows both departmentalization and summarization within those departments would be a tremendous advancement.

THE GREAT INVENTORY DEBATE

In the "cost of goods sold" section in the chart of accounts, the authors of the Ecosoft program assume that an inventory is conducted. This is acceptable until you get to a service firm like a CPA. According to the authors of the program, it is possible to change the program to adopt the no-inventory situation, but unfortunately they do not give an adequate explanation as to how it is accomplished.

However, there is one remarkable aspect of the system. Each month, most accountants have to make up an income statement with the ending inventory — which requires us to make an entry, etc., etc. The income statement program asks for the inventory value and makes a statement entry — automatically.

S-100 Analog I/O Systems



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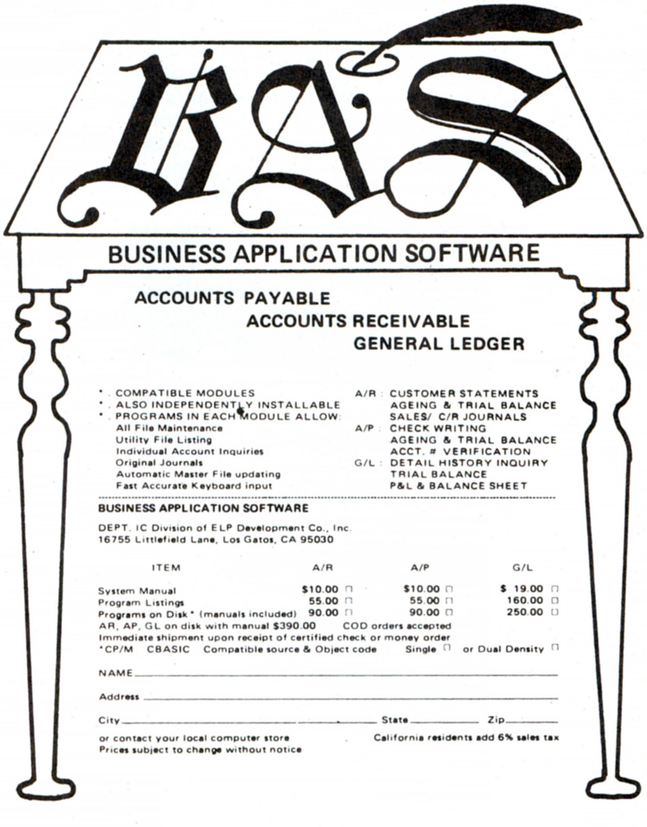

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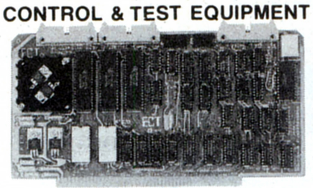

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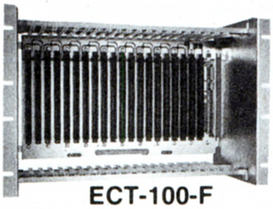

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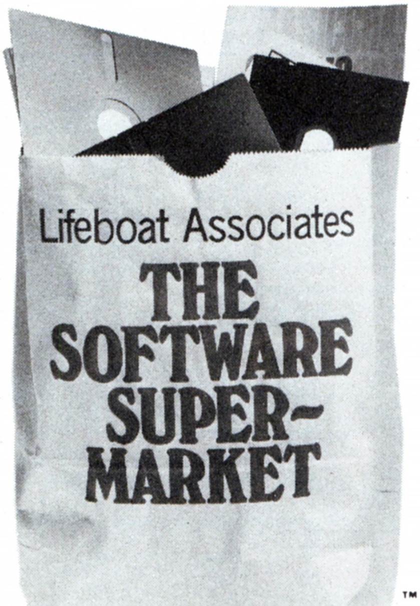

CIRCLE INQUIRY NO. 28

ONCE A MONTH?

It is extremely easy to overlook an income statement every month. The Ecosoft statement will be produced whenever needed, but only on a cumulative basis — in other words, it won't tell what happened for July, only for year-to-date ended July 31. That is acceptable, but it can sometimes lead to troubles if the owners don't look at the statements carefully to ascertain the changes between statements.

SPARE ACCOUNTS WHICH DO NOT PRINT

Ecosoft has set up a set of what they call "spare accounts" — accounts which do not print in the financial statements and are, apparently, out in limbo. This may be a dangerous procedure in a program design — especially if there is something in those accounts and even more so if you personally don't run the accounting program. If I were an employee who handled cash and had the ability to put amounts into hidden accounts which no one could get to — could I have fun with the business. Perhaps I'm being a little harsh, but it's a proven fact that the computer can be a thief's best friend.

THE GENERAL LEDGER IS A JOURNAL(?)

For the purposes of the discussion which follows, here is the difference between a ledger and a journal: Accounting data is recorded in two ways. It is always entered into the accounting records through what is known as a journal. There may be various kinds of journals, and they may be called various different names, such as a voucher register, cash disbursements register, cash receipts book, etc. But they all share one common element. They are organized by date of occurrence. From these journals, data are then summarized by account and then re-entered into another book — which is also historical to the extent that it contains the results of many journals — the ledger. The ledger is organized by type of entry, i.e. all the cash entries are grouped together, all of the expense entries are grouped together. The two documents — the ledger and the journal — are indispensible.

The journal is transaction oriented, containing all of the activity which is related to one accounting transaction. The ledger, on the other hand, is account oriented; it has all of the activity by account affected.

The reason I've explained this is that the Ecosoft program does not contain the word "journal" anywhere in the menu. It turns out, however, that they have a program called "General Ledger" which is not really general ledger at all. It's a nice little journal. It has a little program which makes sure that the debits equal the credits before it will accept the entry, and it keeps track of the debits and the credits. Each entry is given a date and the program even tells how many blocks of memory are left to make entries on. That's very useful in a limited memory (one diskette) system. Note that security requires entering a password to get into the journal program.

The Ecosoft system is limited to six debits and six credits per entry, which is more than sufficient for most applications. If the dollar amount is even, the system automatically enters the cents. If you have pennies, though, you must enter the decimal point, which is something different. But this slight disadvantage is more than offset by the ability to get comments (up to 50 characters) on each of the journal entries. These comments can be check numbers, explanations, anything. As far as I'm concerned this is almost the most important part of the entry.

After entry of a transaction, the user is asked whether it is OK (save it) or scratch it. If saved, it is posted directly to the general ledger files. This is not the most desirable of posting systems, since it is always a good idea to get a handle on what is going into the general ledger — and that can be done only if the journal prints all of the edited transactions before they are posted.

One point about making journal entries is important to note — the Ecosoft system uses the account names, not account numbers.

Now, if we can enter, so we should be able to recall — and that is the purpose of the "search general ledger" program. It allows one to find a transaction by a given date, each time asking the question "is this the one you want ? (Y,N)"

UPDATE

I ran the update program before reading the instructions, and missed the part about the necessity of running the program *after* preparing the income statement. This confusion was caused because update isn't really an update program; it is really a closing program which wipes out all of the income statement information and creates an adjustment to the accounts, which in essence zeros them out for purposes of preparing a financial statement. (The accounts in the ledger remain at their balance, they just act like zero for the income statement program.)

This all may sound somewhat confusing. The advantage of it all is utter simplicity. Unfortunately, what happens in the process is that the ability to produce interim financial statements is lost. One cannot have the program produce financial statements for the first six months of the year plus a financial statement for June without a lot of jockeying. Note that this deficiency is to be seen in many, if not most of the smaller general ledger programs out these days.

There is a very useful program known as "print general ledger" which is designed to give a general ledger print-out, and "print account transactions" which is a little program to generate the contents of a particular general ledger account. Both of these programs are critical, since it is imperative to have a method of obtaining a hard-copy of the general ledger and a method for "peeking" into the contents of a particular account.

Now on the other hand, there is a check register program. As I see it a check register should allow for the entering of all checks, with the accounts debited and credited being indicated on each entry. As a summary step the check register would indicate the totals of the debits and credits.

The Ecosoft program does not work this way. As part of the opening program, the operator is asked for the account to be debited and the account to be credited. Whoops! That means that for all of the checks, only one account is credited and debited. That makes the register much less than useful for other than paying accounts payable. An added feature to the register is the program which takes a beginning check number and adds to it one by one, automatically numbering the checks. Unfortunately it cannot be used as part of a standard check register (one where you can code each check to a different account).

Ecosoft has also included some nice utility programs with their package. One is a depreciation calculation which yields an output which calculates depreciation for yearly amounts under the straight-line, sum-of-the-year digits or double-declining balance methods. Unfortunately the program does not contain provisions for calculating depreciation under the 150% or 125% declining balance methods. These methods, which are used more and more since the tax reform act of 1976, are extremely difficult to handle manually, whereas the straightline method is fairly simple. In any case, the utilities are included as a bonus. They have format for output which gives not only the depreciation expense, but also the accumulated depreciation and the ending "book value" of the asset.

There is also a program which can be used to calculate loan interest and expense and paydown, however, I couldn't get it to run. Perhaps I had some sort of glitch on the program diskette.

In the process of trying to figure out why the interest on loans program would not run, I listed the program and discovered that they were documented with many remarks. It was almost as though the programmer intended for the user to take a look at what he had done.

RECEIVABLES

As in the case of the general ledger programs, the receivables programs are extensively "menu" driven, along with the list of central programs. Note in the menu below that the programs are similar to the general "schema" of the general ledger package.

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*********************** ******************************

1. INITIALIZATION          5. BILL CUSTOMERS
2. CREATE ACCOUNTS         6. PRINT DATA FILES
3. CUSTOMER PURCHASE       7. AGED ACCOUNTS
4. CUSTOMER PAYMENT        8. FIND CUSTOMER/ACCT #

*********************** ******************************
```

The initialization program asks for much of the same detail as the general ledger program, except that there are some receivables information input such as monthly finance charge (yes, the system computes it). Also, there's the percentage of outstanding balance which must be paid each month (the system bills, and just like a credit card system specifies a minimum due) and what the maximum credit is on each customer (which prevents posting to a client account if there is a balance in excess of the limit).

As in every receivables system, there are provisions for the entry of data, posting payments and creating statements. What is missing from the programs is a transaction register (i.e. a printout) which summarizes the day's activities and provides the basis for entry into the general ledger system. In other words, there is no tie-in to the general ledger, and all the detail which is posted to the accounts receivable system must be hand-summarized and then posted to the general ledger system. Unfortunately, it seems like an inefficient system which lacks control. How does the user know, for example, that all sales are posted to the general ledger, and that all cash receipts get posted to each customer's account? The system should provide this kind of detail in order to allow for simplified general ledger bookkeeping with adequate controls.

SUMMARY

The Ecosoft programs retail for an amazingly low price — general ledger is only $79.95 and accounts receivable is $59.95. Also included in their catalog is payroll (not reviewed here) for $69.95 and several non-accounting programs such as multiple regression, personal finance (both for $20 each), and a gradebook package ($39.95). These prices seem very reasonable, to say the least.

The programs do have some faults, but other programs available which provide much more also cost more. In the hands of a good accountant, most of the faults of the general ledger could probably be remedied, or at least compensated for. Thus, a final conclusion regarding the accounting programs is positive. True, these are not Structured Systems programs but, for the money, they are a beneficial set of basic programs. They are convenient and can be taken out of the mail and put up on a system instantly. If you understand the limitations of the programs from the beginning and are willing to live with these system deficiencies, perhaps substituting manual methods to correct them, then my recommendation is generally positive.☐

Carl Heintz and Bob Johnson will be alternating as authors of this column. Software vendors who are interested in having their product reviewed can contact Carl Heintz at 2540 Huntington Dr., San Marino, CA 91108. Bob Johnson can be contacted at 7228 W. Reno St., Rt. 5, Oklahoma City, OK 73108.

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CIRCLE INQUIRY NO. 64

THE MIND REVOLUTION

By Merl K. Miller with Rich Didday

TOP-DOWN VERSUS BOTTOM-UP

So far in this column, we've discussed the ideas and long-range goals of Artificial Intelligence. Our approach has been essentially top-down. We start with a main idea, analyze it, break it down into its component parts, examine each part and then relate everything back to the main idea. It's important to think of these topics in this manner because it gives us a sense of direction; provides new problems for us to work on and points out gaps in our current capabilities.

We can also work bottom-up. We can take a practical, current-day problem and see how far we can go toward making our solution more "intelligent." Neither approach is worth much without the other. Viewed separately, the first is like thinking about going to Cleveland without ever taking a step and the second is like walking around aimlessly without having an idea where we are going. For a change, let's try the second approach.

This month's column is the first of a three-part series attempting to explain a bottom-up approach to using computers. The series will deal with some concepts devised by Dr. Richard L. Didday in his forthcoming book, *Principles of Polite Programming.*

Throughout this series we will identify beginners as "naive users." A naive user is someone totally unfamiliar with the system and, in fact, may know nothing about computers.

Virtually every program intended for a naive user contains some sort of *menu routine* (a list of possible actions a user can take). Let's go through a sequence of menu routines, making each one more "intelligent." We will stick with things that are practical for a microcomputer. Prehistoric menu routines worked like this. The user is shown a numbered list of choices:

```
  ******CHOICES******
  1. Add a new record
  2. Change an existing record
  3. Delete an existing record
  4. Look at an existing record
  5. Quit
Which number? 3 ← user response
```

Example 1.

The routine inputs the user's response, checks to see that it's reasonable (in Example 1, for instance, is it a number from 1 to 5?) and, if so, returns the number. Then a selection is made which carries out the appropriate part of the program. Figure 1 shows how menu selection is carried out. In this case, "describe legal responses" means that the computer will display the lower limit (1), the upper limit (5) and all of the responses (2), (3), (4) that fall between these limits. The select in the main program is usually on ON-GOTO in BASIC, a Computed GOTO in FORTRAN, a CASE statement in Pascal and so on.

```
----main program----
        •
        •
        •
fill menu with user display.

describe legal responses.

call menu routine with menu and
        legal responses.

select on choice returned by menu routine
    1:  carry out Add operation.
    2:  carry out Change.
    3:  carry out Delete.
    4:  carry out Look operation.
                                   Repeat
    5:  Quit
        •
        •
        •

menu routine
    display menu.
    get user response.
                 Repeat if response is invalid
    return number of selected choice.
```

Figure 1. The basic structure of all menu selection processes.

The prehistoric method has one thing going for it — it's very easy to program. However, it's not very polite to the user. The number "3" has no logical relation to the concept "delete," so even an experienced user will need to constantly refer to the menu.

The first step beyond the prehistoric method asks the user for a single letter:

```
******CHOICES******

Add a new record
Change an existing record
Delete an existing record
Look at an existing record
Quit

Which ? (First letter of choice) D ← user response
```

Example 2

Now, at least, you can think "delete" and type "D". This will help reduce the frequency of errors. There are several ways to implement the "describe legal responses" part of this program — the most common is to have the menu routine use the first character of each line in the menu. There is an obvious problem with this scheme. Sometimes odd choices of words and/or letters must be made to avoid having two lines in the menu start with the same letter. For instance, in the University of California at San Diego Pascal system, at one point (in the "Filer"), you type "L" to get a display of a disk's Directory — if you type "d" you get today's Date.

There are quite a few possible elaborations of the basic menu selection idea. Perhaps it would be good to switch from the bottom-up mode to the top-down for a moment.

What would the ultimate menu routing be able to do? Could it differentiate between upper case and lower case letters? Could it compensate for misspellings? What sort of things would a totally naive user attempt?

The table below shows some possibilities:

if a naive user typed this	**this is what the user probably wanted**
add	Add
A	Add
I want to look at some	Look
I wanto make a change.	Change
dlete	Delete
quite	Quit
Chagne	Change
I don't want this recond here any more.	Delete
I give up!	Quit

⋮

In the next two months we will go over the possible naive user responses and think about what would be involved in writing a menu routine that could handle them.

If there really is going to be a true mind revolution we are going to have to make computers accessible to everyone. This means coming up with techniques and methodology that compensate for human errors. Polite programming is certainly a step in the right direction. We would like to hear from you as we explore it in the next two columns. Stay tuned.☐

If you have any opinions, ideas or suggestions relating to the theme of this column contact Merl Miller at 30 N.W. 23rd Place, Portland, OR 97210.

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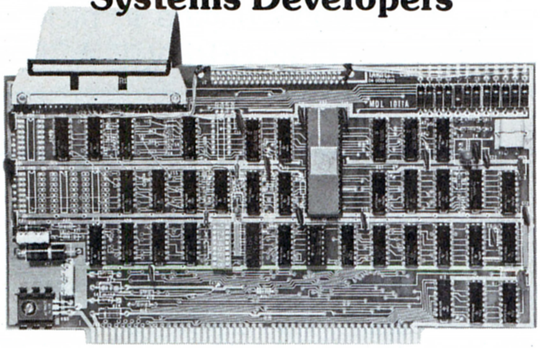

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CIRCLE INQUIRY NO. 51

Ask Eliot Janeway

Interview by Terry Costlow, Assitant Editor

Many computer companies started as garage companies and in a year or two they have grown to become million dollar companies. Have you any advice to help a young company continue that kind of dynamic growth?

JANEWAY: They better look to their finances. The number one reason that companies on the move don't make it is running out of money. These companies in the main have been children of the era of easy money.

Some of them have slowed down and gone under Chapter 11 protection.

JANEWAY: That's right. They're at the wrong end of the social scale. If you're on relief, you can own as many credit cards as you want. If you're in business for yourself you've got to watch it. They're not going to be able to raise money privately. Their blue sky prospects mean nothing with money at 15 percent.

Is there anything the companies under Chapter 11 can do to resume their growth?

JANEWAY: What they have to do is to figure how to get financed in a way that makes sense. In the case of those who have gone under Chapter 11, they have obvious partners don't they: their creditors. If they can stay in 11 and avoid slipping into 10, then I think they can work it out with their creditors.

Anyone in 11 has obvious incentive. Go to your creditors and say, "Look, we're in 11. Give us some 4 percent money, rewrite the debt and we'll give you 20 percent of the company. It might be worth more to you than your interest."

You see, these lenders don't want to look bad. They break their debtors by collecting 15 percent interest when really the interest isn't being earned. Realism would call for the higher rate of interest to be charged off to the return of principal and not credited to earnings.

When the day of reckoning comes, the way to talk is to say "Make your contribution. You want to get your money back? Be my partner."

What about some of the new companies starting up today?

JANEWAY: I think they're probably undercapitalized and they haven't reckoned on the cumulative capital cost of the 15 percent rate of interest over a continuous period of time.

Any advice for the new companies that have started and are small and haven't gone into debt but don't have any capital to grow on?

JANEWAY: They better figure out how to get some capital because there's no sense being in business today in a small scale. They should figure out how to get out or how to get in.

When you go to equity money, you're got to show partners how they can make as much by getting tied up, by taking a chance, by suffering a delay, as they stand to make with their money sitting in a treasury bill taking no risk. The law of participation years ago was about the same as what you get out of a treasury bill today.

So some of the companies have been going along just keeping their head above water would be better off getting out of business?

JANEWAY: That's right. They should quit aggravating and go to work on someone else's payroll.

Other than money and a good product, what do you think a company needs to succeed in the 1980s.

JANEWAY: They need a proprietary product. A small outfit with a proprietary product and its own knowhow can run rings around a big one. But sometimes what they ought to do with a proprietary product is to sell it through someone else. The problem that you've got today is that you can't afford to be in business unless you're in business on a considerable scale.

Do you see an end to "mom and pop" businesses?

JANEWAY: I see a suspension for a year or so.

What will end this suspension?

JANEWAY: A return to cheaper money, which should come in the early 80s.☐

Questions for this column should be sent to Ask Eliot Janeway, P.O. Box 1234, Cerritos, CA 90701. One question per letter please. Personal replies are not possible.

The comments expressed in this column do not necessarily reflect the views of this magazine or the microcomputer industry.
—The editor

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R.H.D.
real handy data

By Robert H. Distler

Last month I left off with defining the construct of our database, and this month continues with the actual input fields associated with a mailing list. The discussion of database design normally calls for the expansion of the binary tree concept and further defining the schema. However, since the purpose of this column is to provide the methodology to real world situations, I will go directly into the setting up of the input fields.

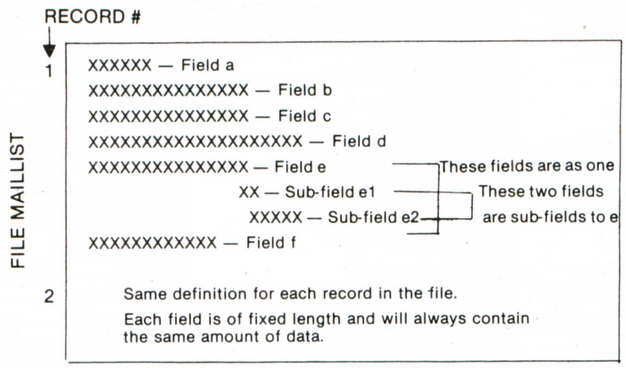
To set up the inputs remember that in the May issue, the database was defined as follows:

- a. a six-digit customer number
- b. a fifteen-character customer name field
- c. a fifteen-character company name field
- d. a 20-character address field
- e. a fifteen-character city field
  - 1. a two-character state field
  - 2. a five-character zip code field
- f. a 12-character phone field

With this knowledge of construct in mind, it is possible now to make the decisions needed to determine the INPUTS to the fields, which when taken as a whole become a record.

Before going into this too deeply, let's first review how the whole construct comes together. Figure 1 demonstrates the functional relationship of the file, record, field and sub-field. Notice that due to the nature of the beast each part is dependent upon the others and so forth. Remember when I defined the schema of the database that all these parts were important and played a specific role in the concept of a database and acquisition of data from it.

The goal now is to figure out some method of inserting the data into the database so that retrieval later is possible based upon the keys we desire, but this is the subject of a later column.


RECORD #
1
XXXXXX — Field a
XXXXXXXXXXXXXXX — Field b
XXXXXXXXXXXXXXX — Field c
XXXXXXXXXXXXXXXXXXXX — Field d
XXXXXXXXXXXXXXX — Field e
XX — Sub-field e1
XXXXX — Sub-field e2
XXXXXXXXXXXX — Field f
These fields are as one
These two fields are sub-fields to e
FILE MAILLIST
2

Same definition for each record in the file.

Each field is of fixed length and will always contain the same amount of data.

Figure 1. Functional relationship of the file, record, field, and sub-fields.

Taking everything we know into account, it is possible to decide that X amount of information is going to be acquired and entered into the computer and saved on some form of storage device. It is important to note that the storage device has not been defined, or its size established. This is a concern for a later time; that is when it is understood what data is and how it is manipulated within a data structure. For now it is sufficient to say that data is to be saved, and the amount is unimportant for discussion purposes.

Table 1. Data Dictionary

Variables	Purpose	
N — Numeric Only	Customer number	— 6 bytes
N$ — Alpha String	Customer name	— 15 bytes
C$ — Alpha String	Company name	— 15 bytes
A$ — Alpha String	Address	— 20 bytes
S$ — Alpha String	City	— 15 bytes
+ (,) delimiter	State	— 2 bytes
Z — Numeric	Zip	— 5 bytes
P — Numeric	Phone	— 12 bytes

We can now set up a data dictionary or record definition. This is that unique table that becomes important for a programmer since it tells him/her what variable is used and with what field, and consequently the method in which it will be handled. Table 1 gives the variables to be used in this model. Normally in a construct, the entry of a logical field begets the next and so on; so is the case here.

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Figure 2 represents an approximation of how the data will be asked for on the input device. Figure 3 approximates the format of the data as far as the computer is concerned and is expressed in number of bytes used.

```
ENTER CUST # (6 DIGITS) ? 123456
ENTER CUST NAME ? DISTLER/ROBERT
ENTER CO NAME ? BIG COMPUTER CO
ENTER ADDRESS ? 1964 TOWER AVE
ENTER CITY, STATE, ZIP ? CERRITOS, CA 90701
ENTER PHONE NO ? 2139269544
```

Figure 2.

The inputs presented appear to be fairly simple, and basically they are. The concept of data input is covered in just about every book written on programming.

You will notice that no mention has been made regarding error checking, error correction, entering more than one record, or terminating the input. These are parts of the mainline program, and discussions of them can be found elsewhere. The goal here is to establish the database. However, over the next few months complete mainline code will be provided.

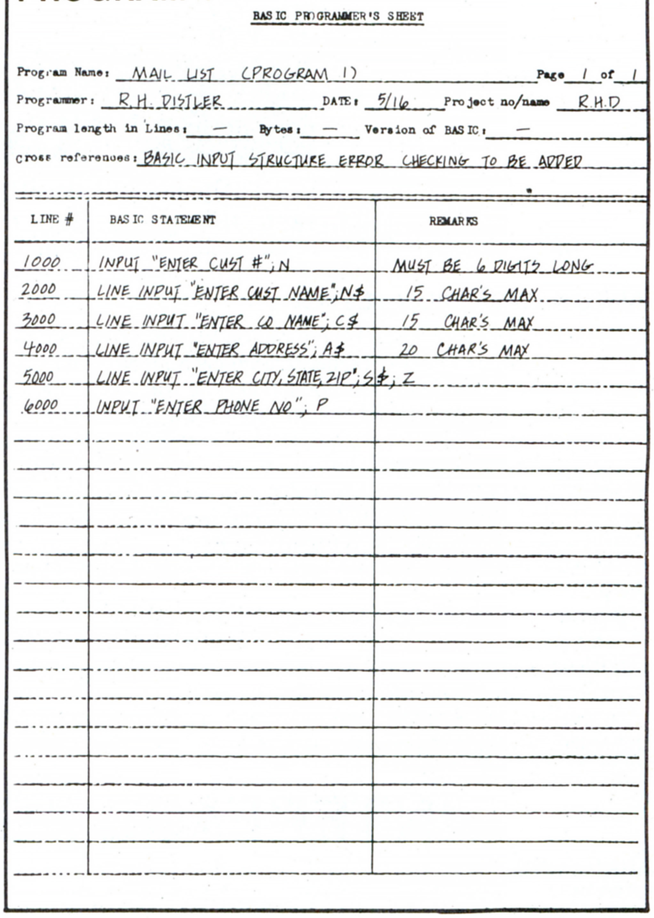
```
MEMORY LOCATION
IN STORAGE BUFFER    <----- WIDTH OF INPUT ----->
 |
 v     5    10    15    20        25    30  •  •    •  •  •  72
1 | 123456                          — 6 byte field
2 | DISTLER/ROBERT|                 — 15 byte field*
3 | BIG COMPUTER CO                 — 15 byte field
4 | 1964 TOWER AVE      |           — 20 byte field*
5 | CERRITOS        |CA|90701|      — 22 byte field  combination of 3 fields
6 | 2139269544  |                    — 12 byte field
7 |                                  (90 bytes in record)
8 |
```

*All fields are fixed length — padded with blanks to fill field
NOTE: Blanks count as valid characters

Figure 3. Approximation of data format in memory — ASCII-representation.

Now that the concept of inputting data has been developed, see Program 1. The discussion must be carried further to define what happens to the data after it is input, how it looks on the actual media and its appearance in the database. These and the methods needed to update the record in several ways will be the subject of discussion next month.☐

PROGRAM 1



BASIC PROGRAMMER'S SHEET

Program Name: MAIL LIST (PROGRAM 1) Page 1 of 1
Programmer: R.H. DISTLER DATE: 5/16 Project no/name R.H.D
Program length in Lines: — Bytes: — Version of BASIC: —
cross references: BASIC INPUT STRUCTURE ERROR CHECKING TO BE ADDED

LINE #	BASIC STATEMENT	REMARKS
1000	INPUT "ENTER CUST #"; N	MUST BE 6 DIGITS LONG
2000	LINE INPUT "ENTER CUST NAME"; N$	15 CHAR'S MAX
3000	LINE INPUT "ENTER CO NAME"; C$	15 CHAR'S MAX
4000	LINE INPUT "ENTER ADDRESS"; A$	20 CHAR'S MAX
5000	LINE INPUT "ENTER CITY, STATE, ZIP"; S$; Z	
6000	INPUT "ENTER PHONE NO"; P	

Do you have a specific question regarding data handling or database management? Then write to R.H.D. care of Robert H. Distler, P.O. Box 6376, Oxnard, CA 93031 or call (805) 487-7422.

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Northeastern Regional Editor

AUTOMATIC VISION TESTER

I wear glasses, as you may have surmised from the pensive looking man that graces the top of this column each month (although, except for the glasses, he looks nothing like the real me). During a recent visit to my optometrist I took the normal eye test in which the doctor displays various drawings across the room, positions an ominous-looking device in front of my face, and flips through a series of lenses, testing to see whether my eyesight has changed since my last checkup. While it is a relatively simple procedure it takes up to fifteen minutes to complete the series of tests. A significant feature of the standard eye tests is that it requires feedback from the patient.

It occurred to me that eye tests must be quite difficult for young children and particularly infants. I began to wonder how an optometrist can tell whether a child of that age could be accurately tested for the need for glasses. It is virtually impossible to get reliable feedback from a two-year-old and absolutely impossible from an infant. They do not understand what is going on and can give no sensible replies to questions like "does this set of lenses produce a clearer image than the last set?". The problem reduces to this: *How can you reliably test people who cannot actively take part in the testing procedure?*

The answer, of course, is to devise a testing procedure that is totally passive; one which does not require the patient to provide feedback.

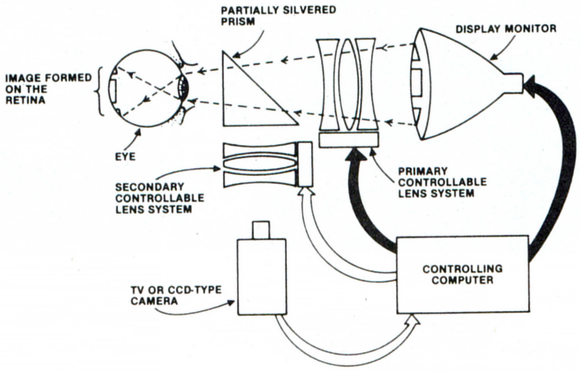
PARTIALLY SILVERED PRISM
DISPLAY MONITOR
IMAGE FORMED ON THE RETINA
EYE
SECONDARY CONTROLLABLE LENS SYSTEM
PRIMARY CONTROLLABLE LENS SYSTEM
CONTROLLING COMPUTER
TV OR CCD-TYPE CAMERA

Figure 1. The Display Monitor Projects an Image onto the Eye's Retina.

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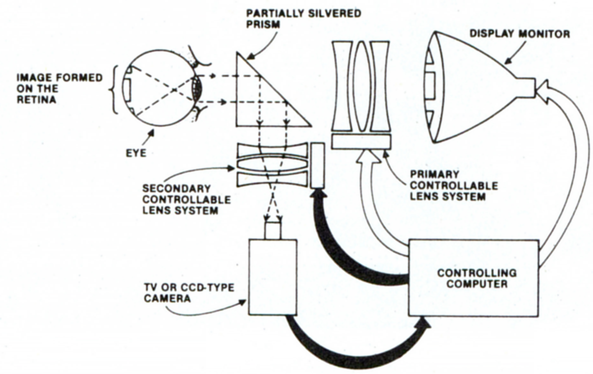
PARTIALLY SILVERED PRISM
DISPLAY MONITOR
IMAGE FORMED ON THE RETINA
EYE
SECONDARY CONTROLLABLE LENS SYSTEM
PRIMARY CONTROLLABLE LENS SYSTEM
CONTROLLING COMPUTER
TV OR CCD-TYPE CAMERA

Figure 2. The Camera Looks into the Eye.

Now how can this be done? How can we know whether the patient is seeing a well focused image? I think I have an answer.

In Figure 1 we position a partially silvered prism in front of the patient's eye. The prism allows light coming from the right to pass through to the left. Light that originates on the left, however, is deflected downward by the partially silvered surface.

On the far right we have a display monitor which, under computer control, can display simple objects such as squares (seen here in the center of the display screen) and triangles (seen at the top and bottom of the screen). The *primary controllable lens system* is under computer control and is used to make the display monitor image appear to the patient to be very close, very far away, or anywhere in between.

In Figure 1 an image comprised of one square and two triangles has been displayed on the display monitor, the computer has set the primary lens system so that the image appears to be, say, ten feet from the patient, and the image of the square and triangles is projected onto the retina of the patient's eye. In other words, the patient can see the image.

In Figure 2 there is a *secondary controllable lens system* positioned below the prism and a TV camera below that. Remember that there is an image formed on the retina of the patient's eye. This image is "seen" by the TV camera because it is "looking" through the secondary lens system, through the prism, and into the patient's eye.

The computer can tell whether the image formed on the retina is a well-focused image by analyzing the image seen by the camera. Since the image is made up of very simple figures (squares and triangles) this is a relatively simple task from a software standpoint.

If the computer determines that the image formed is not well-focused, it can appropriately control the primary and secondary lens systems until a focused image is formed. This will, in effect, tell the computer how much it had to compensate the eye's own ability to focus in order to get a sharp image. This information then directly specifies the prescription for the glasses necessary to correct the patient's vision.

All this is in a matter of seconds. No longer will it take ten to fifteen minutes of the doctor's time to test each patient. He can handle more patients and he can more easily handle those patients such as children, infants, and even the mentally disabled who cannot take an active part in the testing procedure. Such a device could even be used by veterinarians to test the eyesight of animals.☐

Roger Garrett can be contacted at 16 Grinnell Street, Jamestown, RI 02835, (401) 423-0454.

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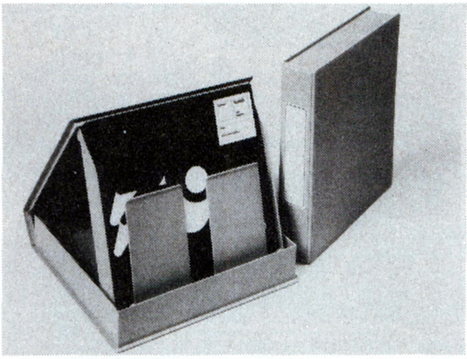

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CIRCLE INQUIRY NO. 3

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- Z80 or 8080 code generation

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CIRCLE INQUIRY NO. 47

Need A System Cabinet? Build It!

By Jack Kirschenbaum
Fullerton College, Fullerton, CA

After the excitement of the first few weeks of computer ownership wears off, the practical side of storage and use can become a problem. I had my Vector Graphic computer (an S-100 system), Cherry keyboard, video monitor, Alpha 1 tape drives and GE Terminet 300 printer on a seven-foot table. The table was a converted door mounted on spindly wooden legs. The wires created an unsightly tangle along the back of the table while manuals and manuscripts filled in the empty spaces. Figure 1 and Photo 1 detail my efforts to rectify this problem.

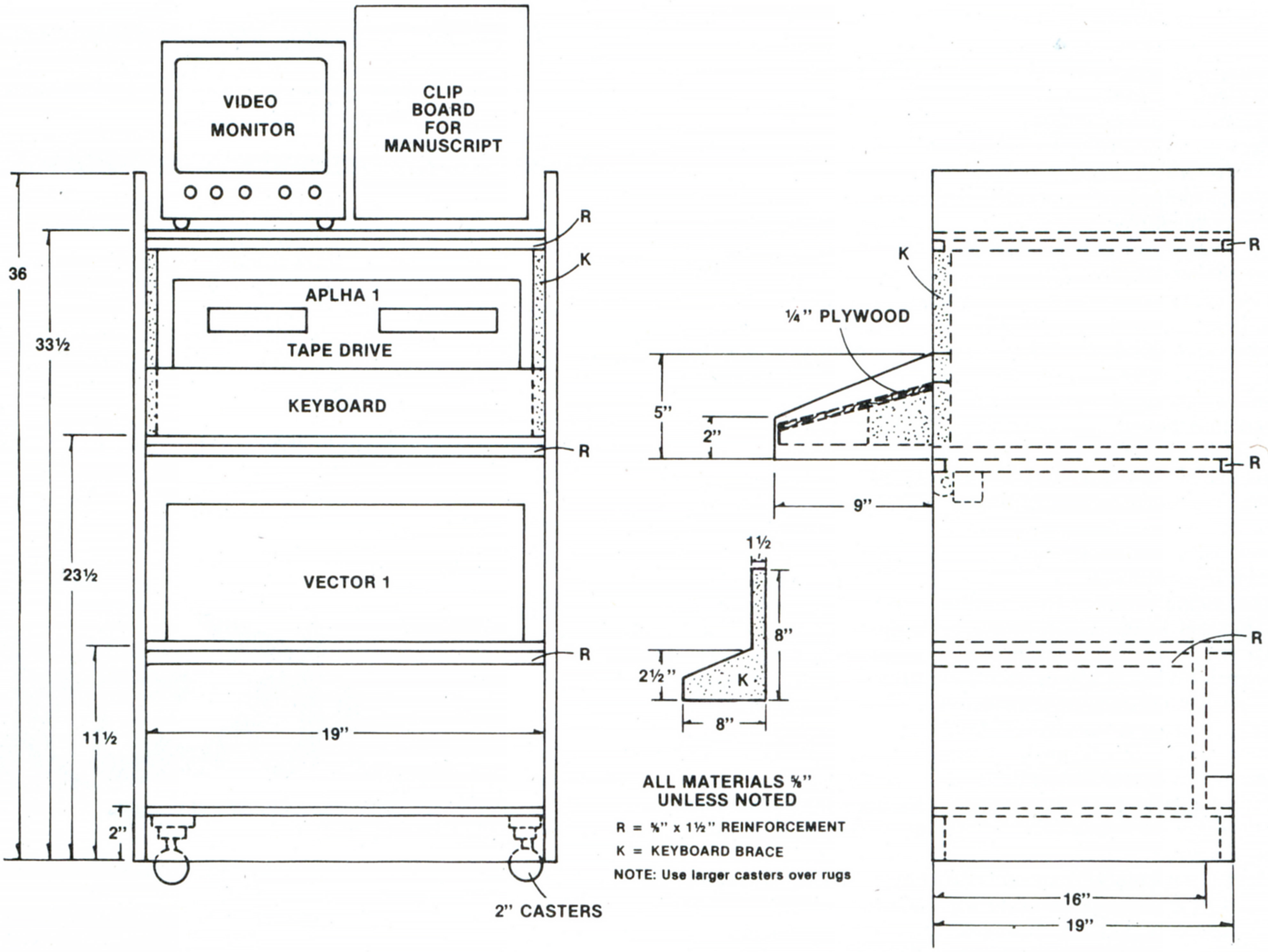
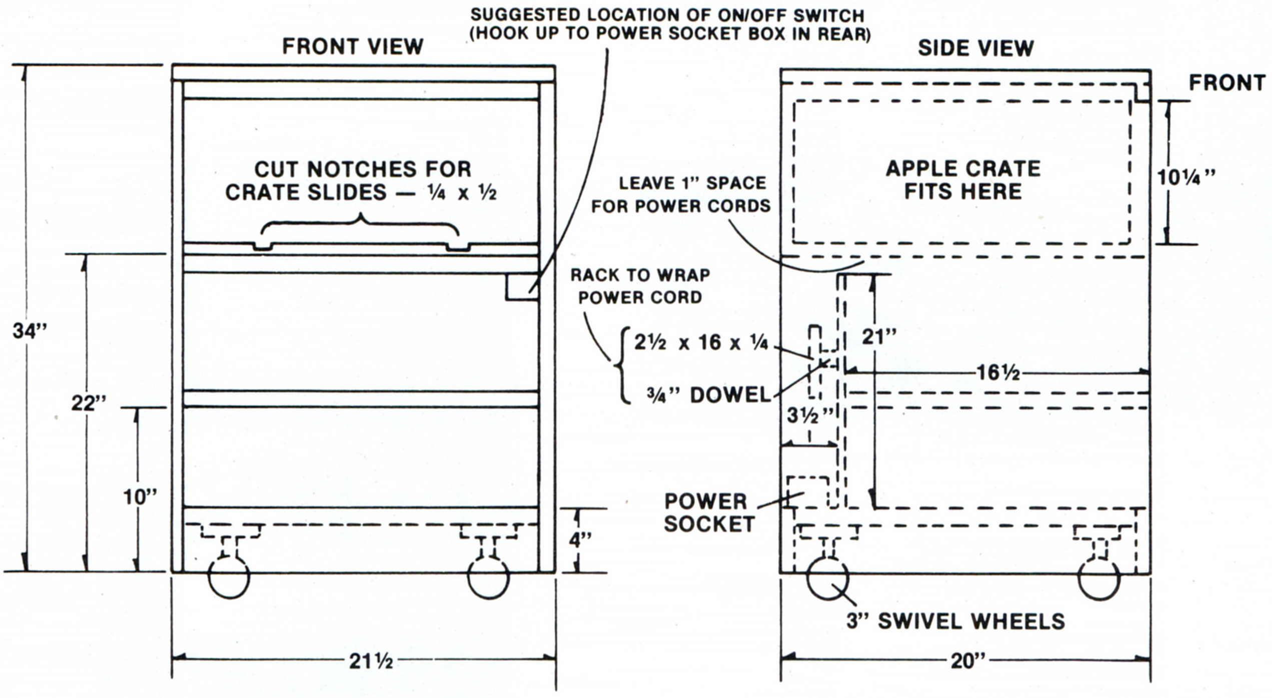

VIDEO MONITOR
CLIP BOARD FOR MANUSCRIPT
R
K
APLHA 1 TAPE DRIVE
KEYBOARD
R
VECTOR 1
R
19"
36
33½
23½
11½
2"
2" CASTERS
K
¼" PLYWOOD
5"
2"
9"
1½
8"
2½"
K
8"
R
R
R
16"
19"
ALL MATERIALS ⅝" UNLESS NOTED
R = ⅝" x 1½" REINFORCEMENT
K = KEYBOARD BRACE
NOTE: Use larger casters over rugs

Figure 1. S-100 Crate.


FRONT VIEW
SUGGESTED LOCATION OF ON/OFF SWITCH (HOOK UP TO POWER SOCKET BOX IN REAR)
SIDE VIEW
FRONT
CUT NOTCHES FOR CRATE SLIDES — ¼ x ½
APPLE CRATE FITS HERE
10¼"
LEAVE 1" SPACE FOR POWER CORDS
RACK TO WRAP POWER CORD
2½ x 16 x ¼
¾" DOWEL
21"
16½
3½"
34"
22"
10"
4"
POWER SOCKET
3" SWIVEL WHEELS
21½
20"

NOTE: ALLOW MORE ROOM WHEN CARTS ARE TO BE USED IN CARPETED AREAS

NOTE: ADJUST DIMENSIONS TO BE COMPATIBLE WITH VIDEO MONITOR

FASTEN WITH GLUE & 2 x 10" PAN HEAD SELF TAPPING SCREWS

Figure 2. Apple Cart.

ALL WOOD ⅜" PLYWOOD. COUNTER SINK 1¼ x 6 PAN HEAD MACHINE SCREWS. GLUE ALL JOINTS.

NOTE: 19" x 10" SIDE PIECE CUT FOR SIDE OF BOX AND LID CUT LID AND BOX SIDE FROM SAME PIECE CAP SIDE FRONT PANEL TO MAKE UP FOR CUT

NOTE: DRILL ENOUGH ⅜ HOLES IN SHELF AND BOTTOM TO EQUAL AREA OF APPLE USED FOR COOLING

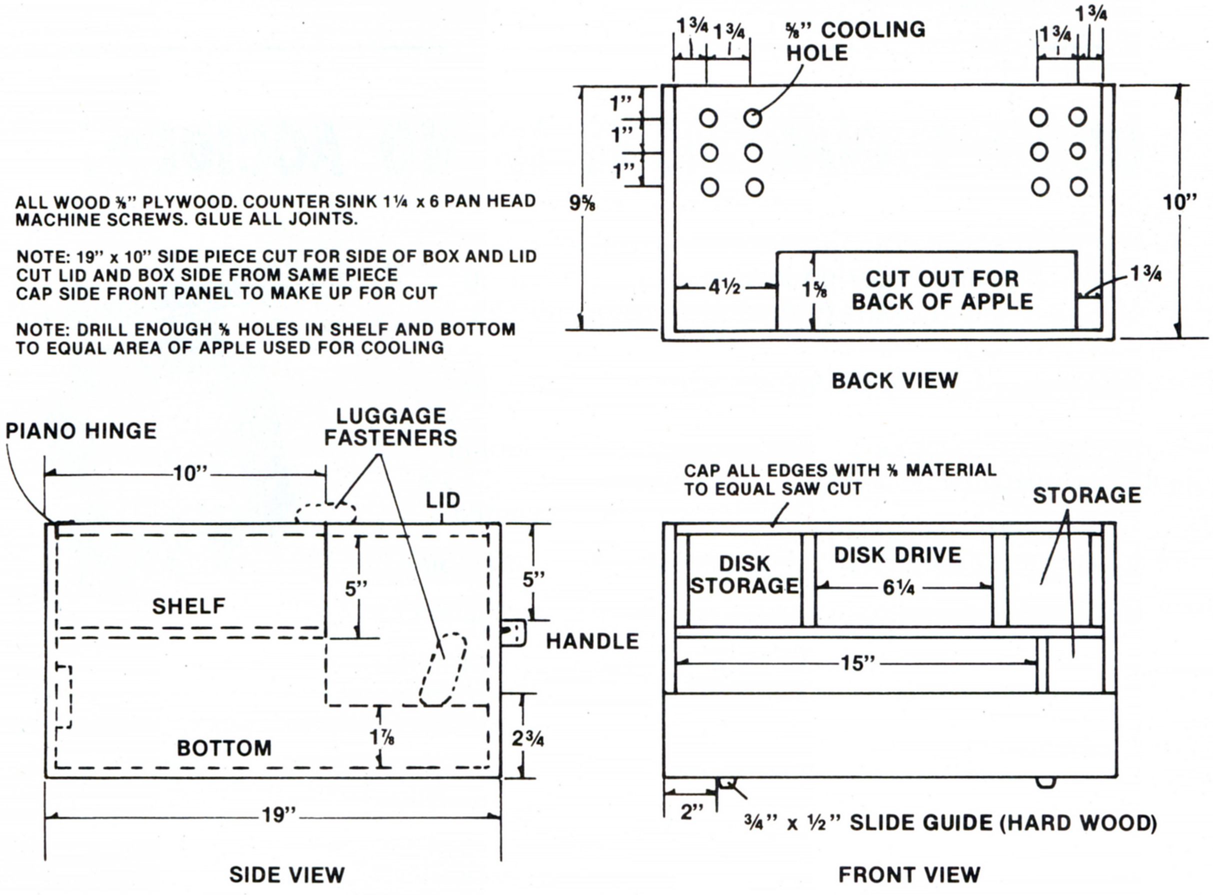
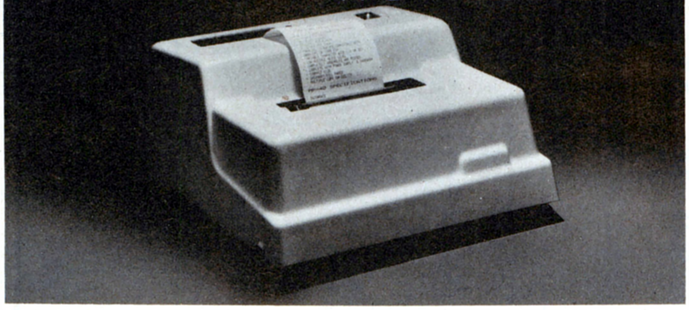

1¾ 1¾
⅜" COOLING HOLE
1¾
1¾
1"
1"
1"
9⅝
10"
4½
1⅝
CUT OUT FOR BACK OF APPLE
1¾
BACK VIEW
PIANO HINGE
LUGGAGE FASTENERS
10"
LID
SHELF
5"
5"
HANDLE
BOTTOM
1⅞
2¾
19"
SIDE VIEW
CAP ALL EDGES WITH ⅜ MATERIAL TO EQUAL SAW CUT
STORAGE
DISK STORAGE
DISK DRIVE
6¼
15"
2"
¾" x ½" SLIDE GUIDE (HARD WOOD)
FRONT VIEW

Figure 3. Apple Crate.



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CIRCLE INQUIRY NO. 35

The design allows enough room for a video monitor, space to house tape drives or disks and computer. There is a shelf on the bottom for manuals, storage for other equipment. The back of the cabinet has provisions for a fused six-outlet electrical box and room for all the connecting cables and power cords to be neatly kept out of harm's way. The

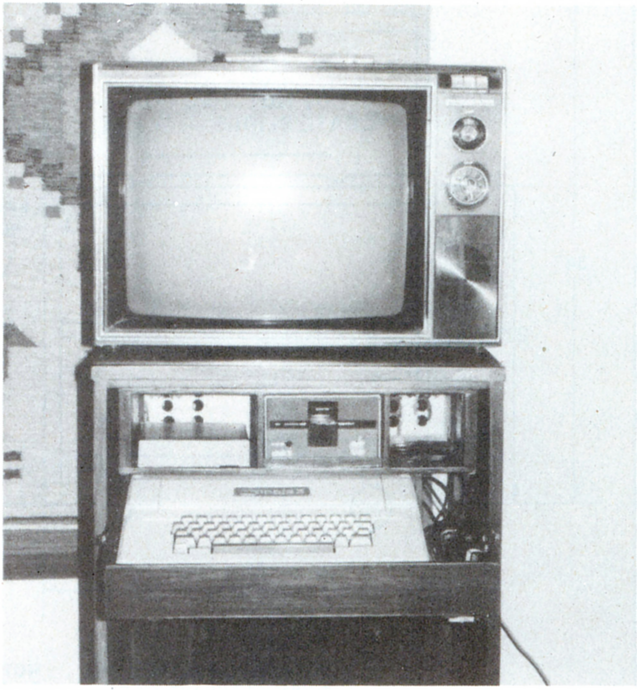
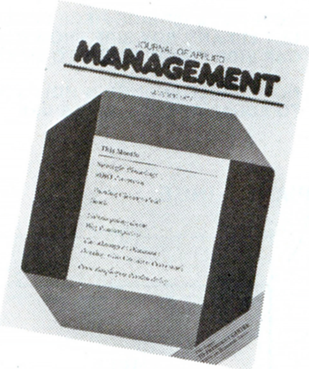


PHOTO 1



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outlet box is a Heathkit JB-60G (or equivalent) that is rewired to a single pole switch mounted under the keyboard. A heavy set of casters under the cabinet allows easy movement. The computer and tape drives can be held down with straps and by storing the monitor in the bottom shelf the whole cabinet can be picked up and carted in a station wagon or truck.

The basic design can be easily customized to suit a variety of computer and equipment configurations. Without modification the current dimensions are large enough to accommodate most S-100 main frames, several mini floppy disk drives and a large monitor. With some slight redimensioning it can make an attractive cabinet for a TRS-80 or PET. A special cabinet and carrying case for the Apple II will also be described.

Before building the cabinet, carefully measure all equipment and make sure that there is enough room to install, maintain and provide for cooling it.

This cabinet is a very simple design and can be cut out and assembled in a few hours. See Figure 1 for the construction diagram. With care, the parts can be cut out with a Skil saw. Five-eighths-inch particle board was used for all the parts except the keyboard case. It is made of ¼-inch plywood and cut out to hold a Cherry Pro keyboard. If your keyboard already has a case, this step can be omitted. I chose particle board to keep the costs down, but the cabinet has worked out so well that walnut veneer plywood would have been better. A quality plywood would have resulted in a furniture grade cabinet. Particle board, however, makes a very sturdy case that takes a nice paint job when it's properly primed.

The cabinet is glued and fastened together with 2" by 10 pan headed self-tapping steel screws. Two pipe clamps help simplify the job by holding the parts together while they are glued and screwed. Remember to drill pilot holes for all screws or the material may split and chip.

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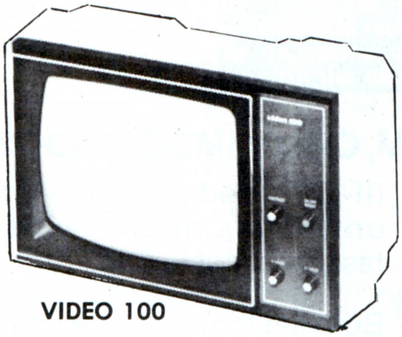

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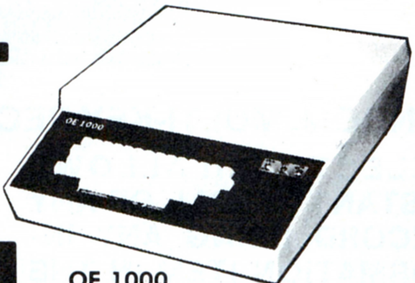

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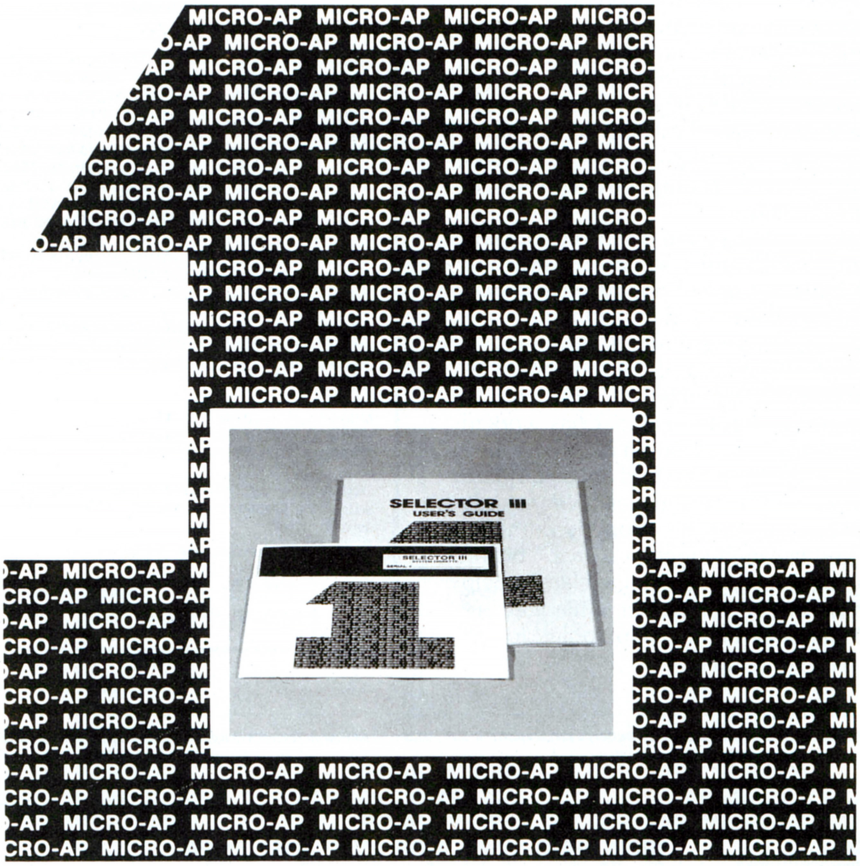

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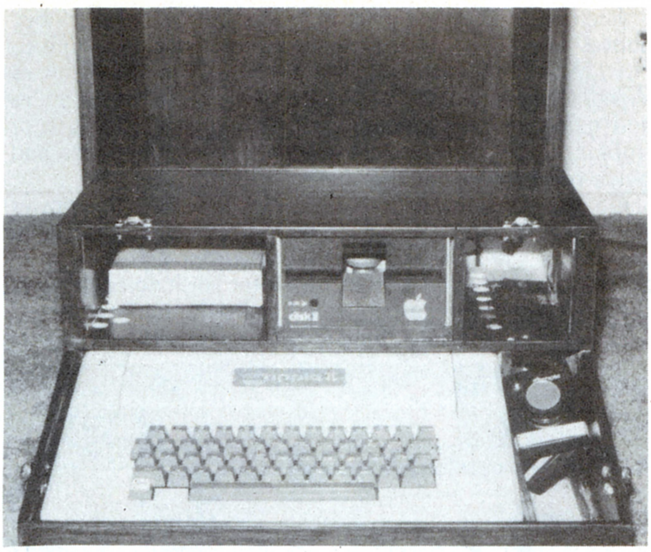

PHOTO 2

APPLE CARTS AND CRATES

After finishing the S-100 cabinet, I got an Apple II, which was to be used in several classrooms.

Even with the Apple carrying case, moving the keyboard, disk drive, video monitor, books, etc. from building to building and room to room was not only tiring but made the system vulnerable to accidental damage. To solve this problem I designed a carrying case that I call the "Apple Crate" and a cabinet for my office that I call the "Apple Cart" (Photos 2 and 3).

The Apple Crate holds the Apple, one or two disk drives and has enough room for manuals, hook up cables, extra disks, light pen, paddles and a lot more. The crate is designed to act as a console and slice into the Apple Cart. The Apple Cart holds the crate and serves as a stand for the video monitor and storage for books and tape recorder.

Like the S-100 cabinet, the Apple Cart keeps the wires and cables out of the way. Since the crate slides in and out of the cart, they combine to make a compact computer center that neatly fits into my tiny college office. When constructed with quality veneer plywood and carefully finished it would fit nicely into a home living room.

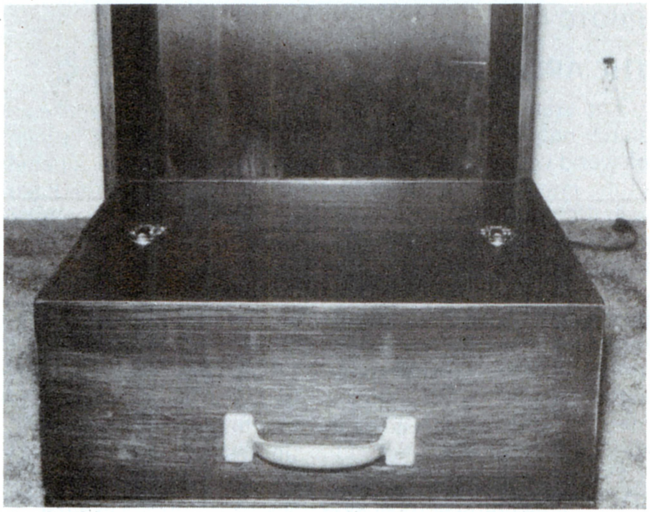

PHOTO 3

The Apple Cart was built using ¾-inch birch veneer plywood to match the college's desks and cabinets. The crate is built out of ⅜-inch pine plywood and ¾-inch birch plywood. Both glue and screws hold the crate and cart together along with assorted hinges and luggage fasteners. The screw holes were pre-drilled to accept a ⅜-inch birch plug to make a smooth furniture finish.

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CIRCLE INQUIRY NO. 34

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HIGHLIGHTS
- Copy, move, or delete a line/paragraph
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- Insert or replace a line(s)

PRINT CONTROLS
The print control commands are inserted into the document and control the formatting as it is being printed. Result—several different formats for the same document such as: Right justification for professional looking letters/documents; Varying line lengths and indentations within one document; Single or double spacing; Headings and varying page lengths

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CIRCLE INQUIRY NO. 10

The construction is similar to the S-100 cabinet described above. The diagrams and layout are provided in Figure 2. Hardwood strips screwed to the bottom of the crate serve as slides. Corresponding notches in the cart receive the slides and guide its travel as you push or pull it out for use or storage. Soap or candle wax rubbed along the slides and guide notches provide lifetime lubrication.

Quality veneer plywood is a pleasure to work with if power saw blades are very sharp. The edges of the plywood can be covered with strips of birch cut from solid stock. To save time, purchase veneer strips sold expressly for finishing edges. The completed cabinet can be stained or finished in any style. I used two coats of polyurethane over walnut stained birch.

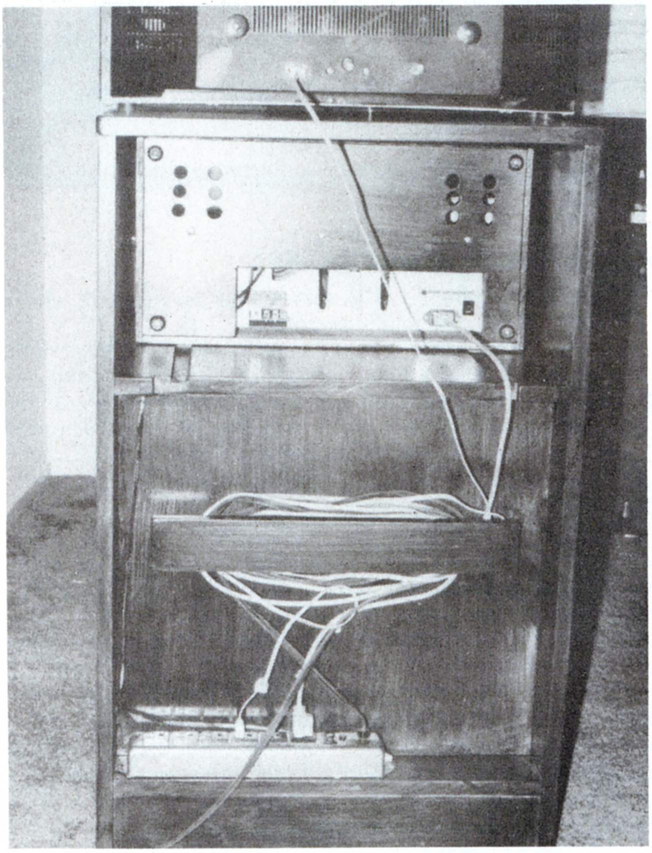


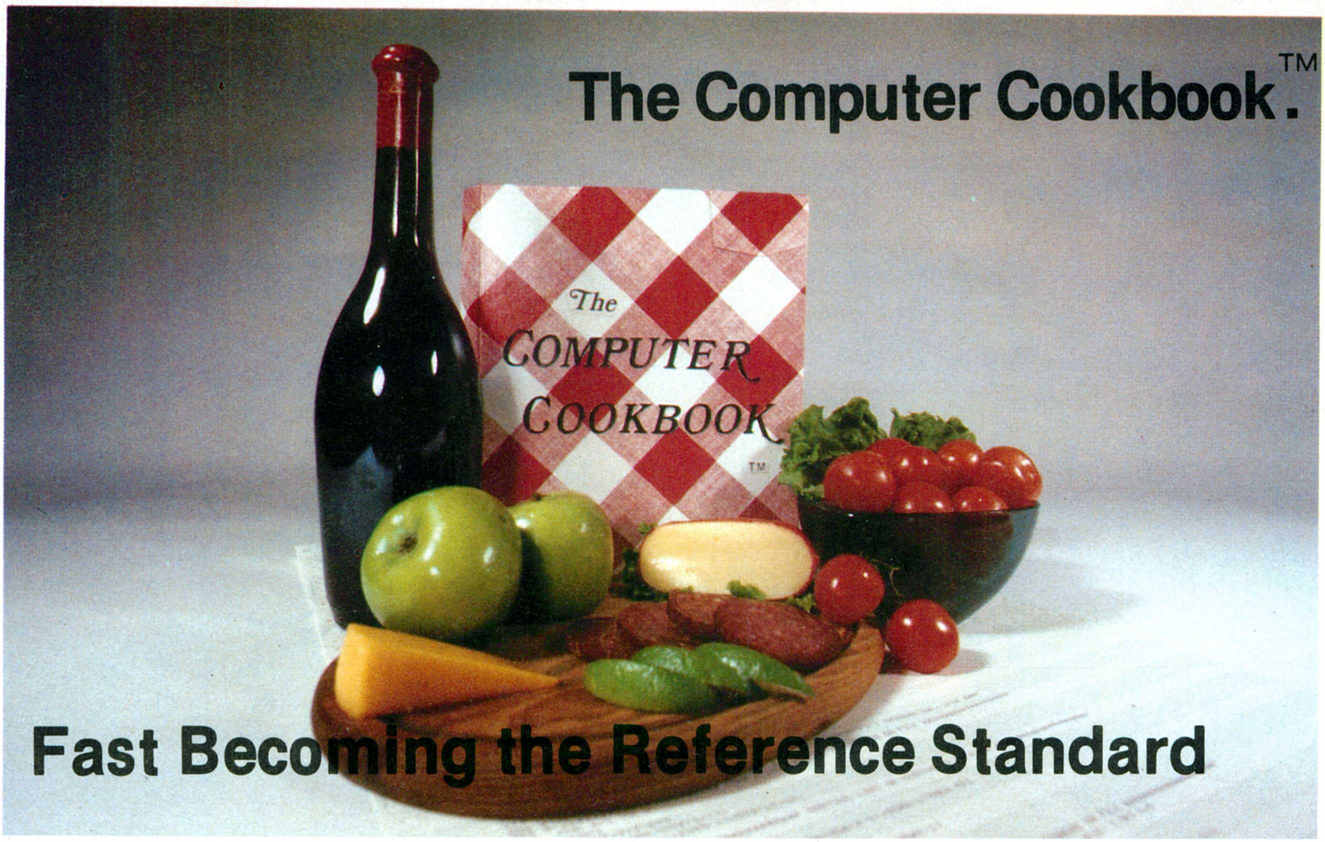
PHOTO 4

THE APPLE CRATE

The crate was made with ⅜-inch plywood which makes a sturdy but very heavy case. If weight is a factor, use ¼-inch plywood with bass angles for reinforcement. The back panel of the crate and the panel above the computer can be lined with the polyfoam that is used to ship the Apple. This acts as a cushion to protect the Apple from shocks as it is transported. Despite this cushioning, shocks can in time loosen some cables and plugs in the computer. If after setting up the system nothing seems to work right, open the crate and Apple case and check for loose wiring. Photo 4 is an example of the wiring I used. I had some problems with the plug from the keyboard to the computer board. The Apple is a sturdy machine and has withstood the rough and tumble portable life very well over the last eight months.

The piano hinges, handle and lid fasteners are common brass fittings found at most large hardware stores. The crate is held together with 1¼-inch by 6 panhead self-tapping steel screws and glue. Be sure to drill cooling holes in the bottom panel of the crate and in the shelf above the computer.

As with the S-100 cart above, the basic design of the crate and cart can be adapted to a variety of needs. TRS-80 and Exidy fans can mount their computer and keyboard in a crate. Some redesigning of the crate will be needed to mount disk drives and/or tape recorders.☐



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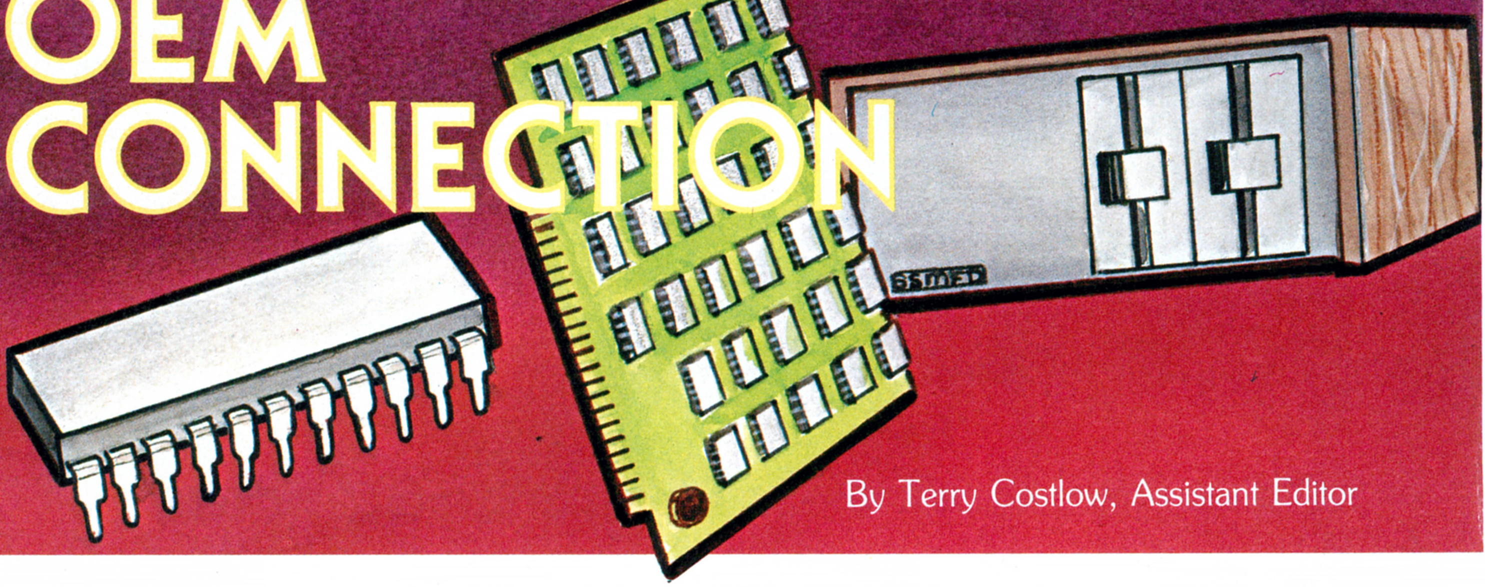
THE OEM CONNECTION



By Terry Costlow, Assistant Editor

After a few raw materials arrive at the manufacturer's shipping dock, they will be quickly transformed into a variety of creations, from microprocessor chips to floppy disk drives to terminals . . .

As these products travel through the hands of other marketeers who add other parts to make systems or add software or even to combine the components of several companies into a specialized package, the purchasers are generally part of the network of Original Equipment Manufacturers. The OEMs are usually thought of as those companies that buy a part of a computer system, add some value to it and resell it.

However, if the buyer owns a computer store, he isn't often thought of as an OEM. If the purchaser is a large company that doesn't resell the items, it can still be considered an OEM.

And companies that buy a completed product and incorporate it into their product often don't consider themselves OEMs, although the people they buy from lump them into that wide-ranging category. Although the term OEM is used often by those in the computer market, most defintions are either vague or very lengthy.

"He (the OEM) can wear many coats. He can be a guy who just buys products from a few different houses and doesn't really add any value other than to put the products together. Ot it can be someone who just adds a piece of hardware to some software he's developed," says Mike Connor, sales and support manager for Apple Computers.

David Mitchell, president of a newly-formed OEM, Carpet Information Systems, explains his view, "Because the market is free and open, there is a wide variety of styles. The OEMs are just links in the chain. I see the OEM as a company which takes a standardized product from a manufacturer and customizes it for a particular customer or application."

A company can be on both ends of the scale, being an OEM to one customer and selling to another OEM. "The way we look at them from the marketing standpoint is that they're the people who use our hardware and their software. But we are an OEM to Qume because we buy in quantity, add value, and resell the product," says Lore Harp, president of Vector Graphic.

Despite the fact that the definitions vary from company to company, or perhaps because it can be changed so freely, OEMs are a strong fixture in the microcomputer market. Intertec Data Systems estimates that 40% of the company's sales go to OEMs. Tarbell Electronics places the company's OEM sales at approximately 60%. Although only about 20% of Vector Graphic's sales are directed to OEMs, Harp says the actual percentage would be much higher since many dealers sell to OEMs.

The term could be dropped, as it has in many other industries, except for the practice of offering different discounts to OEMs, dealers and others.

"We basically discount prices on quantity and on classification. Dealer prices are the lowest, OEMs are next to lowest. But they still get a substantial discount," says Ron Wells, marketing director for Intertec.

Many companies give the dealers larger discounts since the OEMs do more altering and adding, therefore giving the OEMs more of a chance to add onto their profit.

Another reason for dealing with OEMs is the convenience of doing business in quantity and staying with the same people.

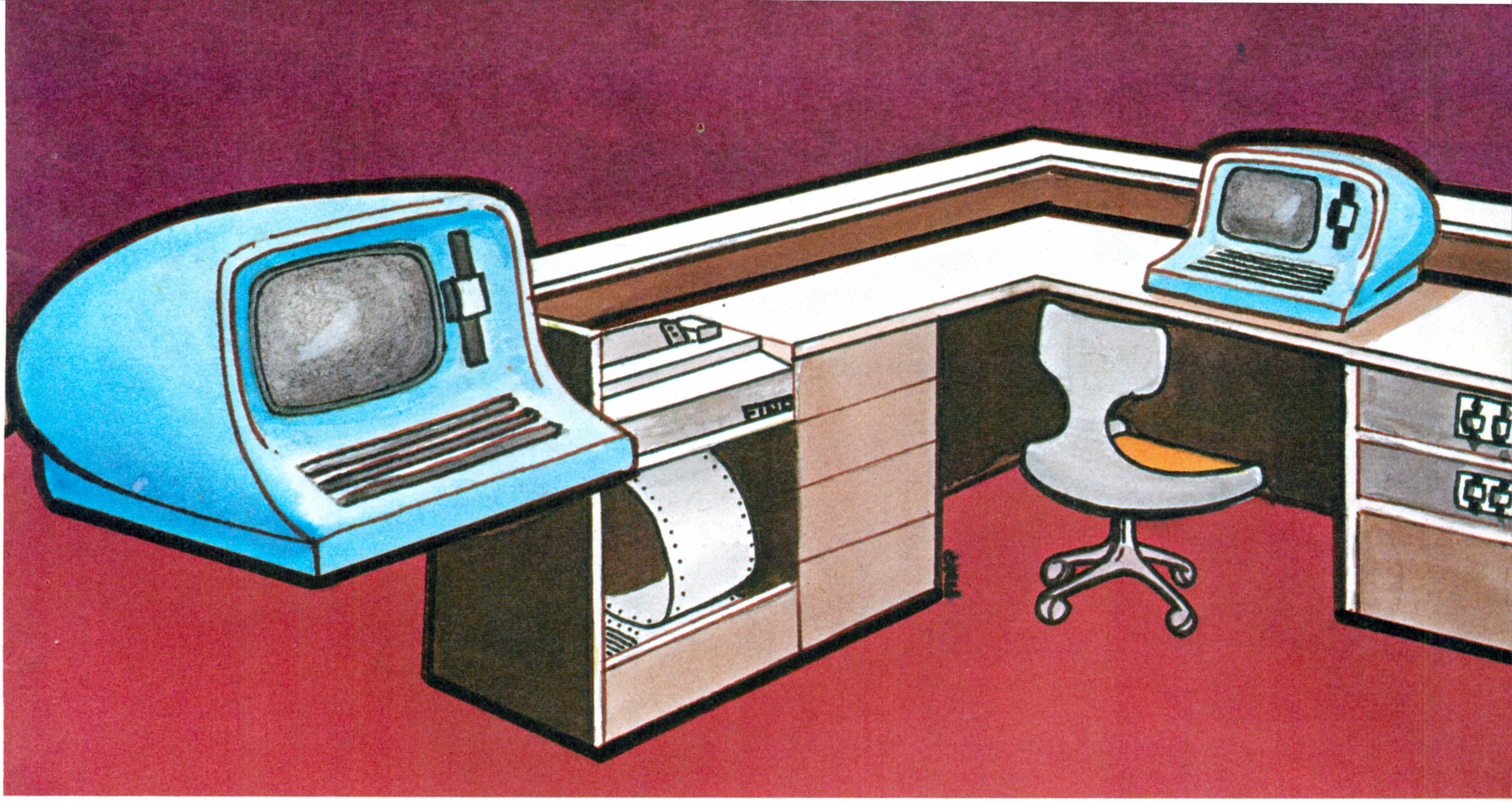
"The OEM adds value, so he has a much greater opportunity to make money on the system because he can resell it for a specific purpose," says Wells.

Both dealers and buyers like to work within the OEM guidelines they establish because of the security it offers. For the dealer, the knowledge that someone has contracted to buy a set number of parts is an aid in production plans. And the buyers know they will be getting goods at the proper time, as well as being able to have a company bend the rules for them when emergencies arise.

Most contracts are set up to run the course of a year, with orders fulfilled at the period of time which is agreed upon by the companies. This too can change. Some companies will complete an OEM sale with one purchase, with the goods delivered as quickly as possible.

The quantity also varies. Sometimes large purchasers may be classified as OEMs simply because they buy in quantity. Although the OEM is generally thought of as a large purchaser, some companies buying less than 10 pieces can be considered OEMs if they fit the criteria.

"An OEM is sometimes thought of as buying 1,000 units, but it may buy only about 50 to 100 units over a shorter period. I would say that 100 systems would be a typical pur-



chase for an OEM over the course of a year," Harp says.

Picking a company to work with is one of the key problems for OEMs. The manufacturers want to find someone who will maintain their product's good name, while OEMs want to use equipment that won't cause problems out in the field.

"What I usually try to do is to make a test investment to see how the business works. You don't go out and buy 1,000 units and hope you get a good one. I typically don't use a product until it's been out a year so I can find out if its track record holds up before I buy it to resell it," explains Mitchell.

"Admittedly, sometimes it's best to be first, but it's generally best to be second and have a system that works."

For the seller, picking the right company to work with is just as important. Although many companies don't have their name on a product that is being marketed by an OEM, it's rarely a secret who supplies what parts.

"We scrutinize the person that's going to sell a product with our name connected to it. We take pride in our product. Next year's reputation is lying on this year's sales," says Jim Alexander, manager of the Micro Systems Group of Pertec.

Apple spokesman Connor also checks closely before signing an agreement with an OEM. "Our concern is that if they don't offer any support, it will hurt our name. If you don't check closely and get a guy who's selling out of his garage then he probably won't be giving any support to the end user. We definitely want to avoid that."

The matter of dealer support brings up another problem: who handles the guarantees? Most companies handle this situation the same way everything else in the OEM market is handled. Any way that works well for them.

Sometimes the company that sells the part will handle it if anything goes wrong during the warranty period. But since some companies' warranty starts the day the part leaves the warehouse, the guarantee can be void before the buyer touches his new computer. This can cause grave problems for both the manufacturer and the OEM if the buyer isn't aware of the problem.

For this and other reasons, most contracts specify that the OEM handle at least part of the guarantee. That not only takes some of the pressure off the manufacturer, but makes for less downtime for the end user. Many OEMs will cover all the repairs under their own warranty. In some cases, this will bring them an additional price reduction.

Apple is one of the companies offering an added discount for those handling the warranty themselves. "If we don't have to warranty it and don't have to take that risk, then we can sell it cheaper," Connor says.

No matter how a company handles its operations with OEMs, they all expect the OEM connection to continue to flourish. Apple Computers has recently begun a new department to handle the OEMs, after turning over OEM sales to dealers for years.

Wells feels the OEM market will continue to grow, with a proliferation in small systems houses, although he foresees few changes from the setup as it operates today. Most persons in the computer industry agree, but few see any changes, largely since it is so vague. And also because it is necessary from both ends.

As the companies grow larger and sell more products, it becomes more important for them to have an easy outlet despite the fact that this means selling the product at a discount.

"If we were to sell directly, we could make more money. But we aren't organized for that. We'd have to hire people to do it," says Harp.

Apple has recently begun a drive to expand its OEM sales after catering almost solely to dealers for the last couple years. Other manufacturers have also expressed interest in getting a larger share of the OEM market.

As more and more microcomputer systems and the accompanying peripherals and software packages are being marketed, both businesses and end users who don't have time to examine all the packages will need the services of an OEM.

And as the computer industry grows and becomes more complex, the engineers who design micros will probably become more involved in their work and drift further from the business of marketing their inventions.

"There will always be a demand for the OEMs as buffer people. If someone makes 1,000 boards a month, he doesn't want to talk to 1,000 buyers each month. And the more complex a product is, the better it is to have these buffers. It would be very difficult for the average end user to talk to the designer of an LSI chip, and probably very annoying for the designer to have to talk to him," Mitchell says.☐

RADIO SHACK INTRODUCES THE TRS~80 MODEL II

Big Business Computing Power in a Small Box

By Carl Warren, Editor-in-Chief

Just about two years ago, August of 1977 to be exact, Radio Shack surprised the microcomputer world with the introduction of the TRS-80 microcomputer system.

The original TRS-80 was innovative in design and surprisingly exciting even with its shortcomings taken into account. Within the two years the TRS-80 has been on the 'micro' market, just about every type of application and use that could be dreamed of has been developed for the tiny machine. The TRS-80 and Radio Shack have both lived up to the commitment of good operation and service.

However, as is axiomatic in the data processing world, the more customers are offered, the more they want. This has been true for Radio Shack. As the TRS-80 began to find its way into more and more businesses, more capabilities were wanted and expected. Radio Shack quickly went to work to fill these gaps, as did a number of outside vendors.

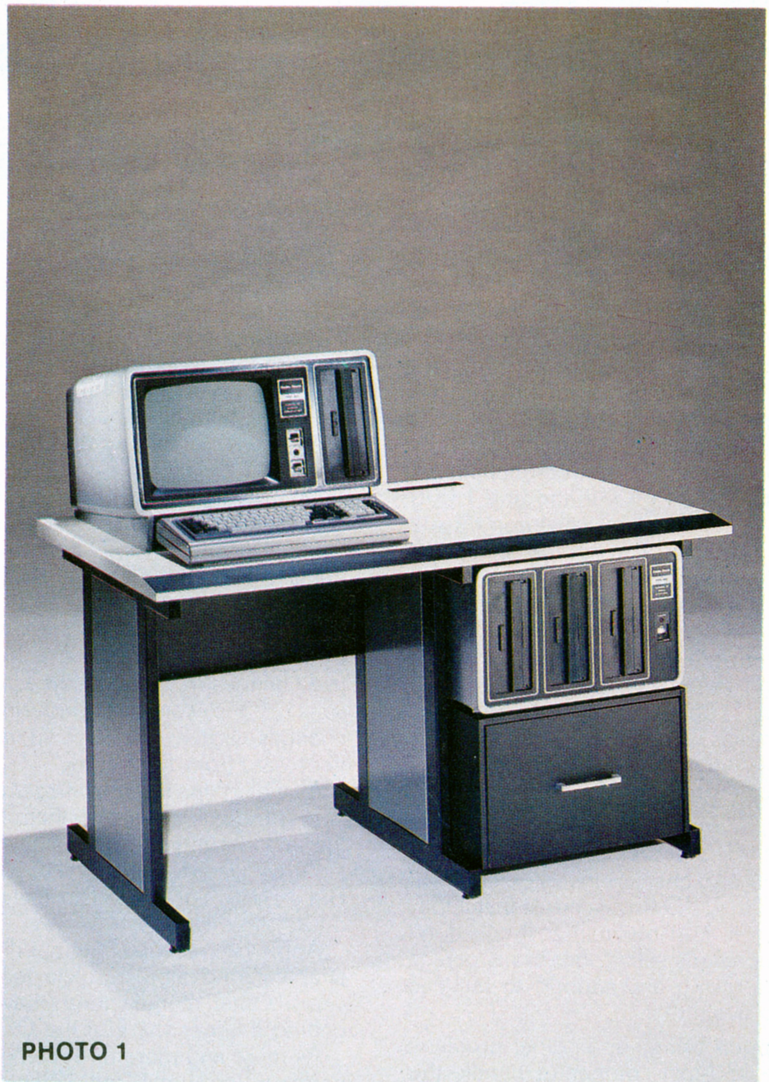


PHOTO 1

One of the major requests of users was increased storage capacity. This was possible to a degree with the addition of up to four 5.25-inch disk drives to the Model I system. Unfortunately, due to architecture and other system considerations, it was not really feasible to add 8-inch drives or dual density controllers.

Because Radio Shack had a fair amount of expertise in dealing with end users of electronic products, they already knew that a new model would be necessary. This realization of a need to expand the TRS-80 system did not come about overnight or as an afterthought to a 'what do we do now' type syndrome. It was designed and planned from the day Radio Shack made a commitment to enter the microcomputer industry.

THE MODEL II

The TRS-80 Model II, or 'MOD 2', as it is referred to inside Radio Shack, is more than an extension of the TRS-80 Model I. The Model II represents a complete redesign of the electronics and basic system layout.

Although Model II still sports a Z-80 microprocessor, the system is designed to use the tiny brain's maximum power by operating at 4MHz. This means, of course, that processing of data can take place faster and transfers from the disks are much quicker.

The basic Model II system consists of the 12-inch high resolution video monitor that has a 24 x 80 display and, for the first time, a complete ASCII character set of all upper and lower case letters. As shown in Photo 2, the main CRT case also houses the main or system disk drive and is part of the basic system.

Also shown in the photo is the re-designed keyboard. Radio Shack designers carefully surveyed the needs of the end user before putting this design together, and as a result incorporated all the standard keyboard functions plus some extras. These include a repeat key and two software programmable special function keys. The inclusion of the special function keys will make it possible for software to be created to make a complete data processing system that requires a minimum of operator intervention.

Other enhancements include DMA (Direct Memory Access) to improve disk transfer rates and allow other processing to continue while a disk operation is taking place. Two RS-232C and one Centronics parallel port have been added to allow for ease of future external expansion.

Because the system is designed to enhance the business environment, additional drives can be added, as shown in Photo 3. The addition of these drives brings the total system storage capacity up to 2 MBytes or two million characters.

Keeping in line with the basic concept of the system—being a high capability machine for a low price — Radio Shack has developed a system desk specifically for the Model II, Photo 4. It adds a feature that was not found in the Model I system desk, that of a drawer. It was found by Radio Shack designers that in a real office environment a drawer was not only desirable but a requirement by most users. The result is a completely functional desk and system designed with the end user in mind, as shown in Photo 5.

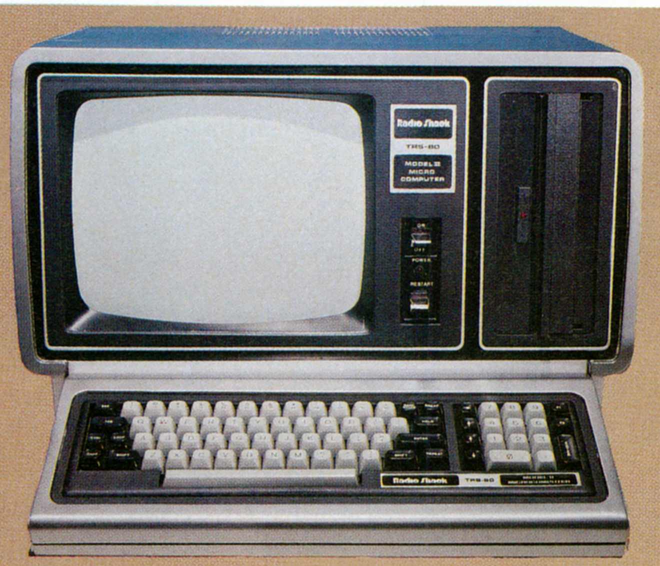


PHOTO 2

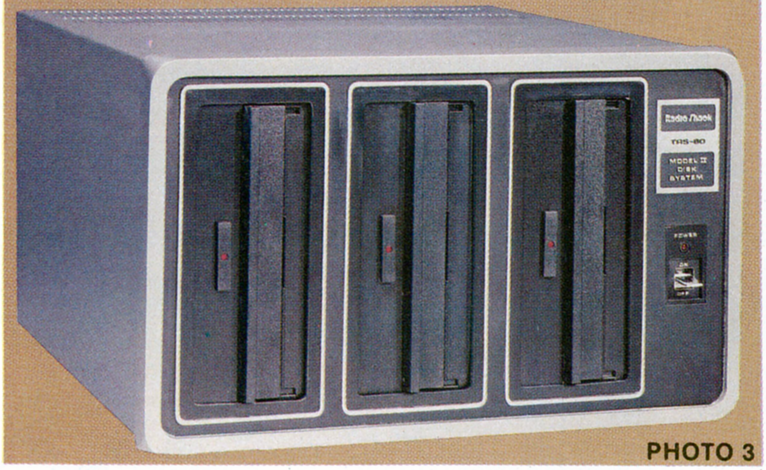


PHOTO 3

SOFTWARE

The software used by the TRS-80 Model II is just as important as the total system design, if not more so. Again taking the cue from what customers said they wanted, Radio Shack opted for an enhanced Level III version of the Level II BASIC currently used on the Model I. The TRSDOS also has undergone several revisions and enhancements to increase the user's capabilities.

In addition to the obvious operating software, Radio Shack designers have also implemented a power up, self test system that immediately checks the operation of the system when it is turned on. This was created to prevent the loss of critical data due to a system problem after power up and initialization.

Since the Model II is indeed a very serious machine, Radio Shack is providing complete business packages in price ranges designed to fit the small businessman's pocketbook. These business packages include: General Ledger, Mailing List, Payroll, Retail Inventory Control, Accounts Receivable and Accounts Payable.

Full commitment has been made by the software designers in Fort Worth to develop packages specifically geared to meet the customer's needs and requirements. They have also prepared BASIC tutorial courses to help the user and are backing these up with books and other learning aids.

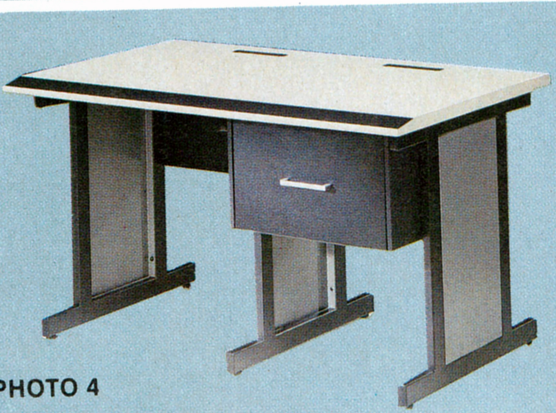


PHOTO 4

HARDCOPY

Because the TRS-80 Model II is a business machine, it is further enhanced with hardcopy printers. Printers are, of course, necessary in the business environment to produce the required reports.

Presently, Radio Shack will be offering two printers to go along with the Model II system.

The first printer is the Line Printer II model number 26-1154. This printer is a low cost, high quality printer that is small and lightweight, about 20 pounds. The Line Printer II prints at the rate of 50 characters per second for 80 characters per line. A facility for printing expanded characters under software control is also built in.

PHOTO 5

The print mechanism is a 7x7 dot matrix and the paper feed is either friction feed or pin feed, depending on the operation. The paper feed functions are part of the total printer package. Pin feeds are included.

The Line Printer III is a high-speed wide carriage printer designed for higher speed applications. The carriage width is a full 132 characters. It prints 120 characters per second.

The speed of this printer is due to bidirectional printing and head design. Like the Line Printer II, the Model III provides for expanded characters. It also features a self test and adjustable tractor feeds for continuous forms.

Both printers have both upper and lower case and come under the Radio Shack warranty. The prices of the printers range from less than $1,000 for the Model II to less than $2,000 for the Model III printer.

According to Radio Shack officials, other printers will be offered during the next several months that will provide even further capabilities. Introduction of these printers will be handled directly through Radio Shack stores and computer centers.

DOCUMENTATION

During the two-year life span of the TRS-80 Model I, Radio Shack learned a great deal about documentation and its importance to the total system. As a result, the Model II system will come equipped with a complete set of documentation describing the use of each and every function the system offers. A great deal of time and effort has been expended on ensuring the accuracy and functional usefulness of the system documentation, even to the eye-pleasing design of the binder, Photo 6.

The documentation doesn't stop at the systems manual, but is being carefully choreographed into a complete program including Radio Shack books on the system and business related subjects. The company also plans to offer programming courses and work in conjunction with Radio Shack Computer Centers to offer updates and new ideas on a regular basis.

COMPUTER CENTER INVOLVEMENT

To help enhance the computer product line and also to provide expertise, Radio Shack developed the Computer Center. These centers are designed to assist the nearby Radio Shack stores with technical expertise and to handle maintenance problems. Fifty stores are planned within the United States, with most of them already in operation or

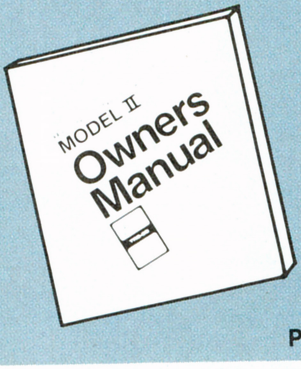


PHOTO 6

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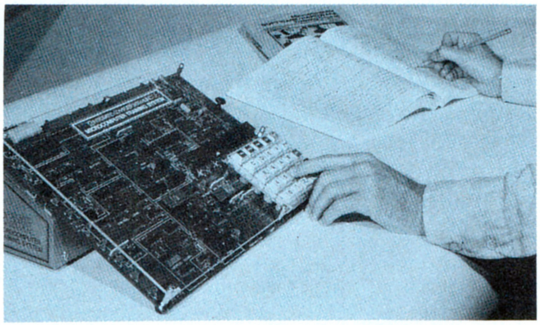

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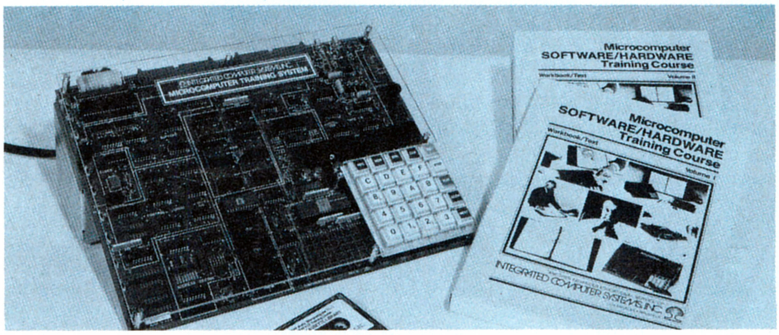
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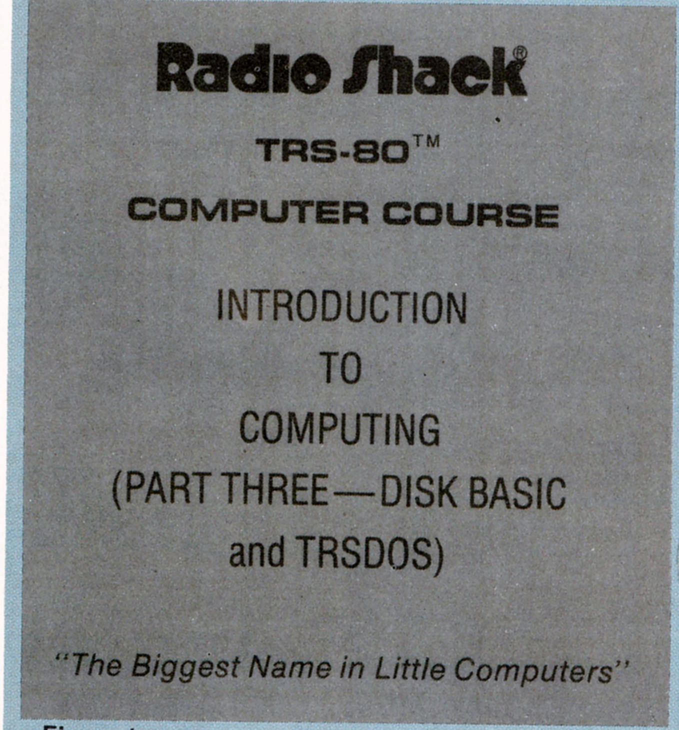
Radio Shack
COMPUTER CENTER
TRS-80

PHOTO 7

PHOTO 8



Radio Shack®

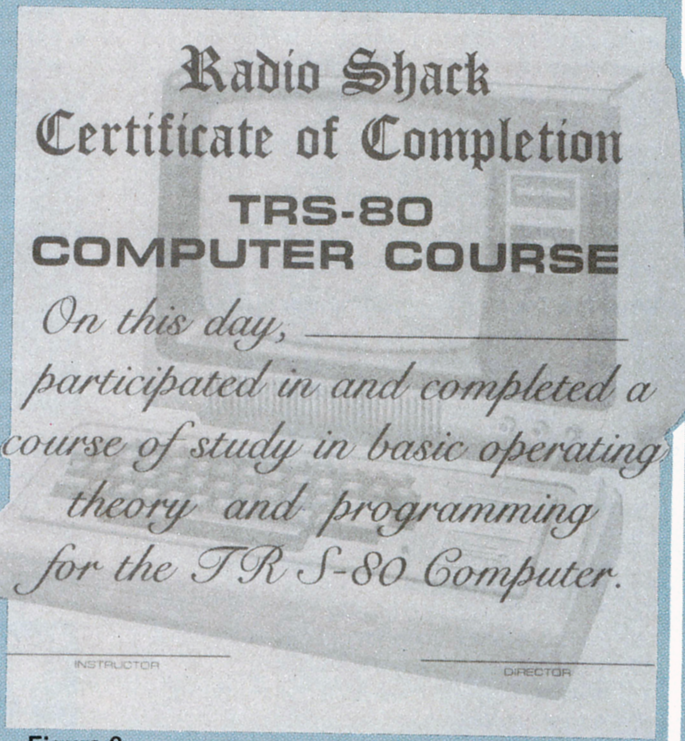
TRS-80™

COMPUTER COURSE

INTRODUCTION
TO
COMPUTING
(PART THREE—DISK BASIC
and TRSDOS)

"The Biggest Name in Little Computers"

Figure 1.



Radio Shack
Certificate of Completion
TRS-80
COMPUTER COURSE

On this day, ______________
participated in and completed a
course of study in basic operating
theory and programming
for the TRS-80 Computer.

INSTRUCTOR

DIRECTOR

Figure 2.

preparing to open within the next few months.

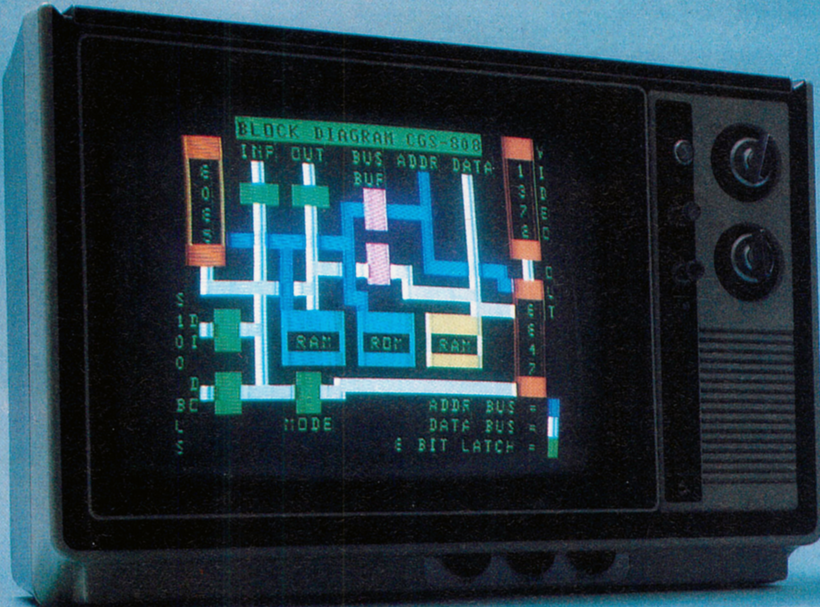
The centers will become, according to Radio Shack executives, a hub of activity and learning for the small businessman regardless of whether he buys the Model I or II. The goal is to raise the businessman's level of expectation not only about the system but in what to expect from a vendor.

Because the centers are designed to assist the businessman in every way possible, they offer programming courses which were developed to help the business or general user better understand what they can do with the computer (Figure 1). Since computers and programming are foreign to most people, Radio Shack has used a little psychology to help remove some of the onus of computers by awarding customers who take the programming course with a certificate of completion, Figure 2, to show the world that they understand computers.

The most important aspect of the computer centers in relation to the TRS-80 Model II is that they are there to help the user and the store owner fully appreciate and correctly use the system.

THE INTELLIGENT COLOR GRAPHICS BOARD

CGS-808



Screen images are as photographed, unretouched.

Main Features

- Motorola MC6847 video display generator.
- Eight colors — green, yellow, blue, red, buff, cyan, magenta, orange.
- 11 programmable modes
  - 1 alphanumeric mode with 32 x 16 character and inverse video.
  - 2 semigraphic modes with 8 colors in 64 x 32 and 64 x 48.
  - 8 full graphic modes with 2 sets of 4 colors ranging from 64 x 64 to 128 x 192, and 2 sets of 1 color in 256 x 192.
- On-board 8085 microprocessor.
- 7½K bytes of on board static RAM.
- Up to 4K bytes of EPROM.
- True S-100 compatibility.

CGS-808

Biotech Electronics proudly announces the CGS-808, a highly sophisticated color graphics board for the S-100 bus.

The CGS-808 is a single board graphics processor which is incredibly simple to use. It is I/O mapped and requires no memory space. It will operate in any S-100 system or as a stand-alone graphics processor. By changing the firmware pack, the CGS-808 can be upgraded to perform additional complex or custom graphic functions. It also provides a parallel I/O port to interface with digitizers, joysticks, light pens, or directly into a keyboard.

The CGS-808 is designed for a low cost, high quality, professional display for applications in medicine, business, education, science, industry, and video games.

Immediate Availability

The CGS-808 is available assembled and tested for $385.00, or the bare "kit" with the MOS chip set for $99.00 (Chip set includes the MC6847, MC1372, 8085 and 2708 EPROM with graphics driver subroutines). Color monitors are available for $495.00. Delivery is from stock.

Dealer inquiries are invited.

For more information, call or write

Biotech Electronics
P. O. Box 485
Ben Lomond, CA 95005
(408) 338-2686

WHAT MAKES MODEL II DIFFERENT

When you first see the TRS-80 Model II, the immediate response is to equate it to the Model I, but in a slightly bigger box with bigger disks. However, as stated earlier, a number of significant changes have been made to the system.

According to Dr. John D. Patterson, director of Tandy Systems Design, the Model II has the features and capabilities of a minicomputer. The Mod II can be compared to the IBM 5110 specifically due to the similarity of the designated market.

Both the TRS-80 Model II and the IBM 5110 have a storage capacity of up to 2 million characters. The important point to note is that the 5110 costs twice as much as the Model II. Interestingly enough, the Model II screen display has almost twice the number of characters as the 5110. Also, by using DMA and the 4MHz operating speed of the Z-80, the throughput of data is on the same performance level of the IBM product.

Even though these improvements on the system have been made and obviously indicate a vast improvement over the Model I features, both machines have a place in the Radio Shack marketing scheme. Both machines will and are being fully supported from all aspects. The biggest plus on the Radio Shack side is that the end user of either the Model I or II is able to get necessary help from the largest dealer network in the world.

Therefore the things that make the Model II different can be summed up in just a few phrases: functional operational capabilities, reliability, ease of service and visibility of the manufacturer to the end user. Very important points to take into account when the consideration to buy is at hand.

PHOTO 9

PRICE AND AVAILABILITY

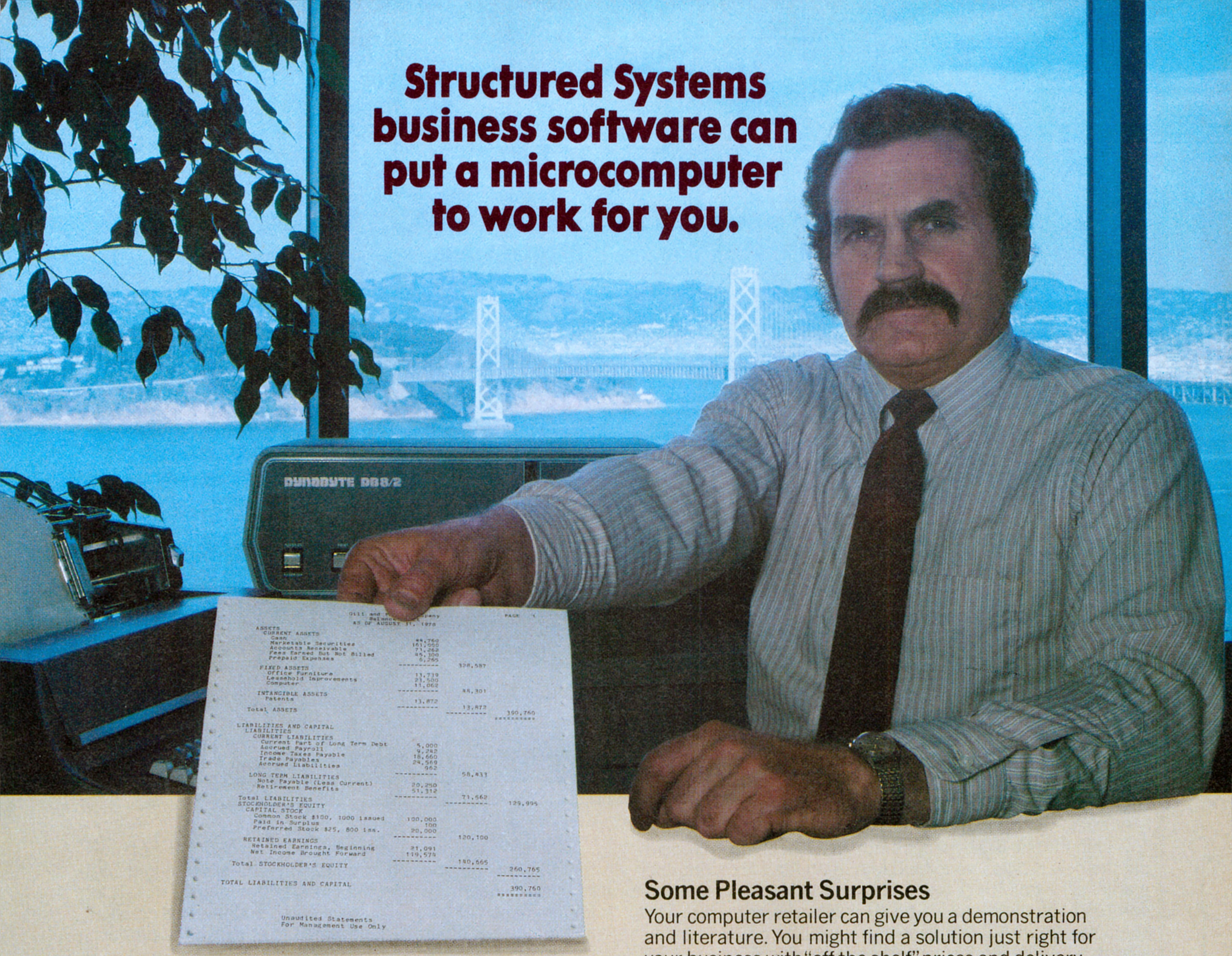
The TRS-80 Model II is now available by mail order through any Radio Shack store or Computer Center. Shipment will begin next month. Company spokesmen suggested that readers contact their local Radio Shack store for more definite information.

The price for the Model II will range from around $3,400 to $8,500 depending on options. According to company officials, with options the Model II represents a significant advancement in microcomputer technology and means that an end user can have the power and flexibility of an IBM 5110 for less than $10,000.

There was one point that Radio Shack wanted to make perfectly clear: "Even though we are introducing a new machine on the market, it does not represent an abandonment of the TRS-80 Model I. Quite the contrary, we plan to maintain our posture as the leader in microcomputing by supporting both machines."

So for those who have purchased a TRS-80 Model I and are concerned about obsolescence, don't be. It's here to stay and be supported. However, if your DP needs have grown, the Model II just may solve your problem.☐

Structured Systems business software can put a microcomputer to work for you.



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                            Gill and [illegible] pany                      PAGE  1
                              Balance [illegible]
                             AS OF AUGUST 31, 1978
    ASSETS
      CURRENT ASSETS
        Cash
        Marketable Securities                      44,760
        Accounts Receivable                       161,000
        Fees Earned But Not Billed                 71,262
        Prepaid Expenses                           45,300
                                                    6,265
                                               ----------    328,587
      FIXED ASSETS
        Office Furniture                           13,739
        Leasehold Improvements                     23,500
        Computer                                   11,062
                                               ----------     48,301
      INTANGIBLE ASSETS
        Patents
                                                   13,872
                                               ----------     13,872
    Total ASSETS                                           ----------    390,760
                                                                       ==========
  LIABILITIES AND CAPITAL
    LIABILITIES
      CURRENT LIABILITIES
        Current Part of Long Term Debt              5,000
        Accrued Payroll                             9,242
        Income Taxes Payable                       18,660
        Trade Payables                             24,569
        Accrued Liabilities                           962
                                               ----------     58,433
      LONG TERM LIABILITIES
        Note Payable (Less Current)                20,250
        Retirement Benefits                        51,312
                                               ----------     71,562
    Total LIABILITIES                                      ----------    129,995
    STOCKHOLDER'S EQUITY
      CAPITAL STOCK
        Common Stock $100, 1000 issued            100,000
        Paid in Surplus                               100
        Preferred Stock $25, 800 iss.              20,000
                                               ----------    120,100
      RETAINED EARNINGS
        Retained Earnings, Beginning               21,091
        Net Income Brought Forward                119,574
                                               ----------    140,665
    Total STOCKHOLDER'S EQUITY                             ----------    260,765
                                                                       ----------
  TOTAL LIABILITIES AND CAPITAL                                          390,760
                                                                       ==========


             Unaudited Statements
             For Management Use Only
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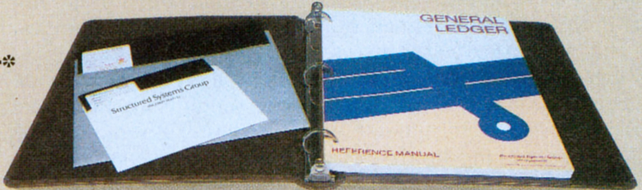

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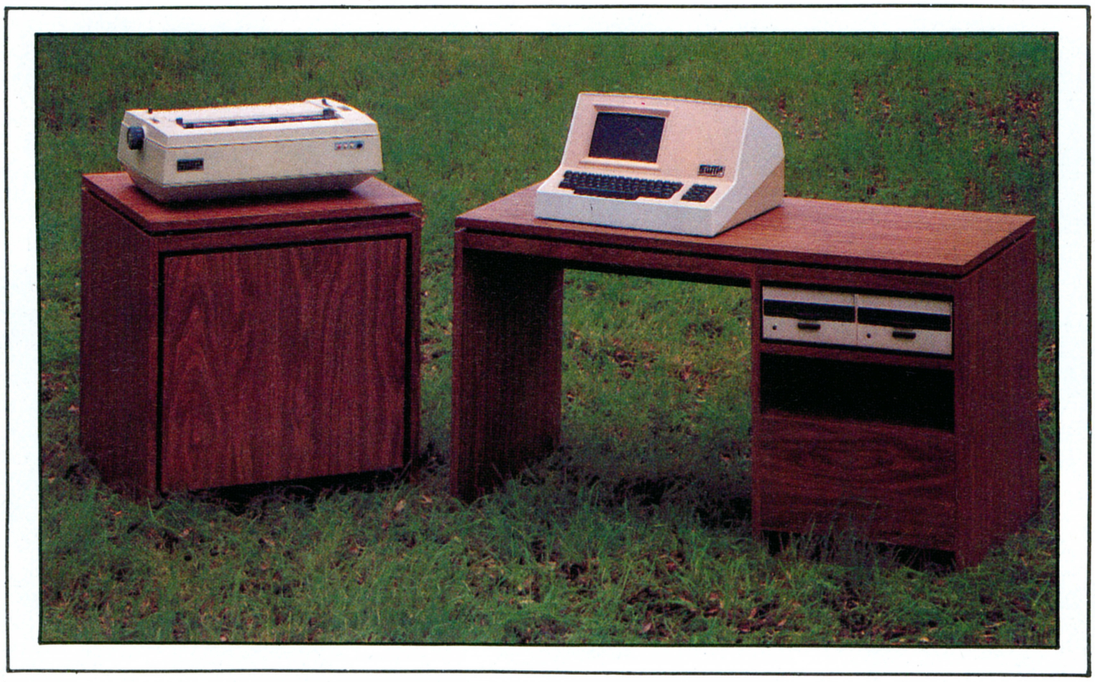
* Complete prices will vary with equipment and software selected. Required: 8080 or Z-80 based computer running a CP/M or CP/M-compatible disk-based operating system. Your retailer or SSG can advise on specifics. (CP/M is a product of Digital Research.)

SYSTEM OF THE MONTH

Southwest Technical Products' 6809 Custom Series

By Carl Warren, Editor-in-Chief



Within the last year, many rumors have been heard regarding the new processors to be released on the microcomputer market. The one processor that has received the most attention has been the Motorola 6809 microprocessor chip. This chip, designed to supplant the popular 6800, is now available and beginning to appear in products.

Southwest Technical Products, the company that first introduced the low cost 6800 system, is ready again with their new line of 6809 products. Working closely with Motorola over the past several months, Southwest has been preparing the introduction of the new line with several option choices.

The Southwest 6809 line is engineered to make the most of the power of the new chip plus offer the end user a wide range of system choices. The choices range from a minimal 40K system with terminal, CPU, and dual 5.25-inch floppy disks as shown in Photo 2, to a multi-user system supporting up to eight terminals, high speed printer and a hard disk system, Photo 3.

Because of the architecture of the 6809 and Motorola product support, Southwest is able to offer systems with up to 384K of addressable RAM. The 6809 system offers both functional equivalency to the 6800 for the programmer and hardware compatibility for the system designer. These facts of the processor and much more were taken into account in the development of the new product line.

THE BASICS OF THE SYSTEM

The basic 6809 system consists of a 40K CPU, two 5.25 dual floppy drives, and a CT82 intelligent terminal for around $3,500. The system is easily expanded to support additional terminals and up to 384K. Also the system is capable of supporting 5.25, eight inch, or hard disk systems separately or all at the same time. Consequently more than sufficient storage is available for whatever the application.

The interesting thing about the Southwest 6809 system is that the configurations and operations are all designed with business in mind. Because the business community is such an important part of computer sales today, Southwest even offers a complete set of furniture designed to enhance the product.

INTERFACING TO HARDCOPY

To keep the system as flexible as possible, Southwest is able to support a number of printers. The top of the line printer is the Decision Data 6540 serial printer. The printer, shown in Photos 1 and 4, provides the user with bi-directional printing with print rates up to 120 characters per second. This printer offers a high degree of reliability due to the feed screw design for head movement. The printer also provides 132 character widths and multi-part form printing capability.

To allow maximum character throughput, the printer has a 512 character internal buffer and adjusts printing speed automatically depending on the speed of the character stream being sent to it. Figure 1 is an example of the character set and flexibility of the printer. Even though this printer is dot matrix, it can be seen from the figure that the printing quality is sufficient even for word processing.

Like the rest of the new system, this printer is designed with the user in mind, with snap-in ribbon cartridges and easy servicing by removing the back panel. This printer sells in the $2,200 range and is well worth the price when compared to other similar hardcopy systems.

Southwest is able to support the IBM electronic typewriters, Photo 5, by providing a simple interface board that goes between the keyboard, computer and typewriter mechanism. This makes it possible for the IBM typewriter to be used without adding expensive and less reliable solenoid mechanisms.

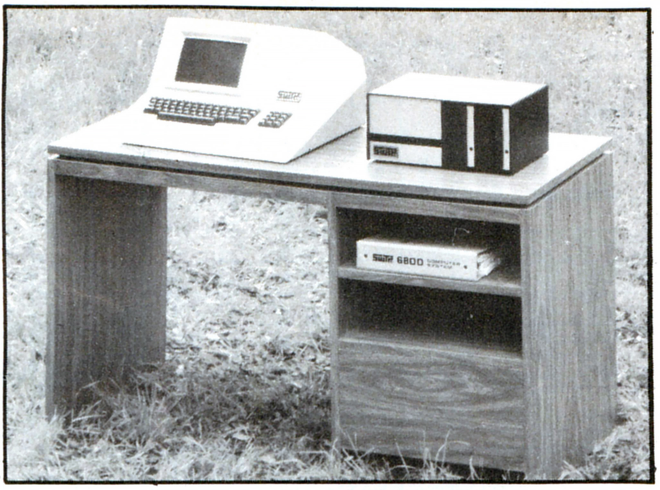


PHOTO 2

PHOTO 3

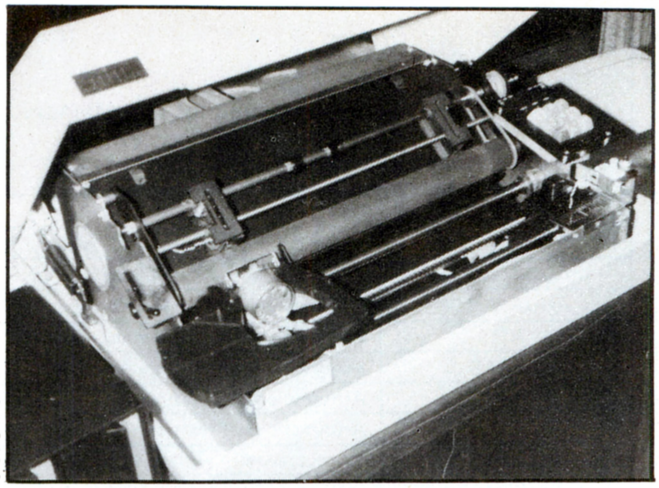


PHOTO 4

PHOTO 5

Southwest is also supplying another printer, Photo 6, which is an 80-character dot matrix printer and is designed to fit into the smaller businessman's budget while providing a high degree of hardcopy capability.

THE HARD DISK SYSTEM

With the advances in disk technology and the needs of mass storage for small businesses, one of the most reliable and cost effective storage methods is hard disk technology.

So that a complete business system could be offered, Southwest developed a hard disk system to be compatible with the 6809 line. This hard disk system uses a Marksman drive with Winchester technology and a 16-megabyte fixed disk.

What makes the Southwest hard disk unique is the employment of a 6800 controller and a 2K buffer memory on the onboard controller. By using the 6800 onboard, the controller is intelligent and most disk housekeeping is done on the board, thus reducing the amount of time the central processor needs to access the disk. The data transfer speeds are handled at DMA speeds. Photo 7 shows the final checkout of the system.

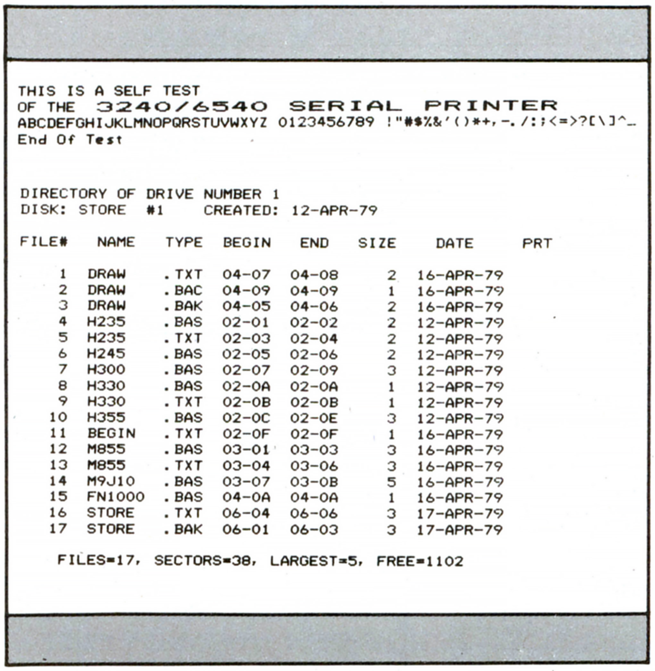
SOFTWARE

One of the main concerns of chip designers is software compatibility of existing software. This was one of the concerns of Motorola in designing the 6809. It needed to be compatible to a degree with the 6800. Tables 1 through 5 show the instruction set and addressing modes.

Even though the software compatibility exists it is necessary to rewrite existing software to take advantage of the power of the system. Southwest has contracted Technical Systems Consultants to do this. The new BASIC is designed to provide speed, accuracy and multi-user support. In addition, 6809 versions of the assembler, editor and wordprocessor will be made available.

To maintain the lead in 6809 software, Southwest is in the process of developing a 6809 version of Pascal to be introduced later this year.

The operating system allows full utilization of the 6809's ability to handle multiple users and provide user memory management. Most significant is the speed in which the operating system interacts with the rest of the system.



```
THIS IS A SELF TEST
OF THE 3240/6540 SERIAL PRINTER
ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789 !"#$%&'()*+,-./:;<=>?[\]^_
End Of Test


DIRECTORY OF DRIVE NUMBER 1
DISK: STORE  #1    CREATED: 12-APR-79

FILE#  NAME    TYPE  BEGIN  END    SIZE   DATE       PRT

    1  DRAW    .TXT  04-07  04-08     2  16-APR-79
    2  DRAW    .BAC  04-09  04-09     1  16-APR-79
    3  DRAW    .BAK  04-05  04-06     2  16-APR-79
    4  H235    .BAS  02-01  02-02     2  12-APR-79
    5  H235    .TXT  02-03  02-04     2  12-APR-79
    6  H245    .BAS  02-05  02-06     2  12-APR-79
    7  H300    .BAS  02-07  02-09     3  12-APR-79
    8  H330    .BAS  02-0A  02-0A     1  12-APR-79
    9  H330    .TXT  02-0B  02-0B     1  12-APR-79
   10  H355    .BAS  02-0C  02-0E     3  12-APR-79
   11  BEGIN   .TXT  02-0F  02-0F     1  16-APR-79
   12  M855    .BAS  03-01  03-03     3  16-APR-79
   13  M855    .TXT  03-04  03-06     3  16-APR-79
   14  M9J10   .BAS  03-07  03-0B     5  16-APR-79
   15  FN1000  .BAS  04-0A  04-0A     1  16-APR-79
   16  STORE   .TXT  06-04  06-06     3  17-APR-79
   17  STORE   .BAK  06-01  06-03     3  17-APR-79

   FILES=17, SECTORS=38, LARGEST=5, FREE=1102
```

Table 1. 8-Bit Accumulator and Memory Instructions.

		Addressing Modes								
Mnemonic(s)	**Operation**	Implied	Immediate	Direct	Extended	Extended Indirect	Indexed	Indexed Indirect	Relative	Relative Indirect
ADCA, ADCB	Add memory to accumulator with carry	—	X	X	X	X	X	X	X	X
ADDA, ADDB	Add memory to accumulator	—	X	X	X	X	X	X	X	X
ANDA, ANDB	And memory with accumulator	—	X	X	X	X	X	X	X	X
ASL	Arithmetic shift left memory location	—	—	X	X	X	X	X	X	X
ASLA, ASLB	Arithmetic shift left accumulator	X	—	—	—	—	—	—	—	—
ASR	Arithmetic shift right memory location	—	—	X	X	X	X	X	X	X
ASRA, ASRB	Arithmetic shift right accumulator	X	—	—	—	—	—	—	—	—
BITA, BITB	Bit test memory with accumulator	—	X	X	X	X	X	X	X	X
CLR	Clear memory location	—	—	X	X	X	X	X	X	X
CLRA, CLRB	Clear accumulator	X	—	—	—	—	—	—	—	—
CMPA, CMPB	Compare memory with accumulator	—	X	X	X	X	X	X	X	X
COM	Complement memory location	—	—	X	X	X	X	X	X	X
COMA, COMB	Complement accumulator	X	—	—	—	—	—	—	—	—
DAA	Decimal adjust A-accumulator	X	—	—	—	—	—	—	—	—
DEC	Decrement memory location	—	—	X	X	X	X	X	X	X
DECA, DECB	Decrement accumulator	X	—	—	—	—	—	—	—	—
EORA, EORB	Exclusive or memory with accumulator	—	X	X	X	X	X	X	X	X
EXG R1, R2	Exchange R1 with R2 (R1, R2 = A, B, CC, DP)	X	—	—	—	—	—	—	—	—
INC	Increment memory location	—	—	X	X	X	X	X	X	X
INCA, INCB	Increment accumulator	X	—	—	—	—	—	—	—	—
LDA, LDB	Load accumulator from memory	—	X	X	X	X	X	X	X	X
LSL	Logical shift left memory location	—	—	X	X	X	X	X	X	X
LSLA, LSLB	Logical shift left accumulator	X	—	—	—	—	—	—	—	—
LSR	Logical shift right memory location	—	—	X	X	X	X	X	X	X
LSRA, LSRB	Logical shift right accumulator	X	—	—	—	—	—	—	—	—
MUL	Unsigned multiply (AXB → D)	X	—	—	—	—	—	—	—	—
NEG	Negate memory location	—	—	X	X	X	X	X	X	X
NEGA, NEGB	Negate accumulator	X	—	—	—	—	—	—	—	—
ORA, ORB	Or memory with accumulator	—	X	X	X	X	X	X	X	X
ROL	Rotate memory location left	—	—	X	X	X	X	X	X	X
ROLA, ROLB	Rotate accumulator left	X	—	—	—	—	—	—	—	—
ROR	Rotate memory location right	—	—	X	X	X	X	X	X	X
RORA, RORB	Rotate accumulator right	X	—	—	—	—	—	—	—	—
SBCA, SBCB	Subtract memory from accumulator with borrow	—	X	X	X	X	X	X	X	X
STA, STB	Store accumulator to memory	—	—	X	X	X	X	X	X	X
SUBA, SUBB	Subtract memory from accumulator	—	X	X	X	X	X	X	X	X
TST	Test memory location	—	—	X	X	X	X	X	X	X
TSTA, TSTB	Test accumulator	X	—	—	—	—	—	—	—	—
TFR, R1, R2	Transfer R1 to R2 (R1, R2 = A, B, CC, DP)	X	—	—	—	—	—	—	—	—

NOTE: A and B may be pushed to (pulled from) either stack with PSHS, PSHU (PULS, PULU) instructions. See Table 3.

Table 2. 16-Bit Accumulator and Memory Instructions.

		Addressing Modes								
Mnemonic(s)	**Operation**	Implied	Immediate	Direct	Extended	Extended Indirect	Indexed	Indexed Indirect	Relative	Relative Indirect
ADDD	Add memory to D accumulator	—	X	X	X	X	X	X	X	X
CMPD	Compare memory with D accumulator	—	X	X	X	X	X	X	X	X
EXG D, R	Exchange D with X, Y, S, U, or PC	X	—	—	—	—	—	—	—	—
LDD	Load D accumulator from memory	—	X	X	X	X	X	X	X	X
SEX	Sign Extend	X	—	—	—	—	—	—	—	—
STD	Store D accumulator to memory	—	—	X	X	X	X	X	X	X
SUBD	Subract memory from D accumulator	—	X	X	X	X	X	X	X	X
TFR D, R	Transfer D to X, Y, S, U, or PC	X	—	—	—	—	—	—	—	—
TFR R, D	Transfer X, Y, S, U, or PC to D	X	—	—	—	—	—	—	—	—

Table 3. Index Register/Stack Pointer Instructions.

Mnemonic(s)	Operation	Implied	Immediate	Direct	Extended	Extended Indirect	Indexed	Indexed Indirect	Relative	Relative Indirect
CMPS, CMPU	Compare memory with stack pointer	—	X	X	X	X	X	X	X	X
CMPX, CMPY	Compare memory with index register	—	X	X	X	X	X	X	X	X
EXG R1, R2	Exchange D, X, Y, S, U, or PC with D, X, Y, S, U, or PC	X	—	—	—	—	—	—	—	—
LEAS, LEAU	Load effective address into stack pointer	—	—	—	—	X	X	X	X	X
LEAX, LEAY	Load effective address into index register	—	—	—	—	X	X	X	X	X
LDS, LDU	Load stack pointer from memory	—	X	X	X	X	X	X	X	X
LDX, LDY	Load index register from memory	—	X	X	X	X	X	X	X	X
PSHS	Push any register(s) onto hardware stack (except S)	X	—	—	—	—	—	—	—	—
PSHU	Push any register(s) onto user stack (except U)	X	—	—	—	—	—	—	—	—
PULS	Pull any register(s) from hardware stack (except S)	X	—	—	—	—	—	—	—	—
PULU	Pull any register(s) from hardware stack (except U)	X	—	—	—	—	—	—	—	—
STS, STU	Store stack pointer to memory	—	—	X	X	X	X	X	X	X
STX, STY	Store index register to memory	—	—	X	X	X	X	X	X	X
TFR R1, R2	Transfer D, X, U, or PC to D, X, S, U, or PC	X	—	—	—	—	—	—	—	—
ABX	Add B-accumulator to X (unsigned)	X	—	—	—	—	—	—	—	—

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Table 4. Branch Instructions.

		Addressing Modes								
Mnemonic(s)	**Operation**	**Implied**	**Immediate**	**Direct**	**Extended**	**Extended Indirect**	**Indexed**	**Indexed Indirect**	**Relative**	**Relative Indirect**
BCC, LBCC	Branch if carry clear	—	—	—	—	—	—	—	X	—
BCS, LBCS	Branch if carry set	—	—	—	—	—	—	—	X	—
BEQ, LBEQ	Branch if equal	—	—	—	—	—	—	—	X	—
BGE, LBGE	Branch if greater than or equal (signed)	—	—	—	—	—	—	—	X	—
BGT, LBGT	Branch if greater (signed)	—	—	—	—	—	—	—	X	—
BHI, LBHI	Branch if higher (unsigned)	—	—	—	—	—	—	—	X	—
BHS, LBHS	Branch if higher or same (unsigned)	—	—	—	—	—	—	—	X	—
BLE, LBLE	Branch if less than or equal (signed)	—	—	—	—	—	—	—	X	—
BLO, LBLO	Branch if lower (unsigned)	—	—	—	—	—	—	—	X	—
BLS, LBLS	Branch if lower or same (unsigned)	—	—	—	—	—	—	—	X	—
BLT, LBLT	Branch if less than (signed)	—	—	—	—	—	—	—	X	—
BMI, LBMI	Branch if minus	—	—	—	—	—	—	—	X	—
BNE, LBNE	Branch if not equal	—	—	—	—	—	—	—	X	—
BPL, LBPL	Branch if plus	—	—	—	—	—	—	—	X	—
BRA, LBRA	Branch always	—	—	—	—	—	—	—	X	—
BRN, LBRN	Branch never (3, 5 Cycle NOP)	—	—	—	—	—	—	—	X	—
BSR, LBSR	Branch to subroutine	—	—	—	—	—	—	—	X	—
BVC, LBVC	Branch if overflow clear	—	—	—	—	—	—	—	X	—
BVS, LBVS	Branch if overflow set	—	—	—	—	—	—	—	X	—

Table 5. Miscellaneous Instructions.

		Addressing Modes								
Mnemonic(s)	**Operation**	**Implied**	**Immediate**	**Direct**	**Extended**	**Extended Indirect**	**Indexed**	**Indexed Indirect**	**Relative**	**Relative Indirect**
ANDCC	AND condition code register	—	X	—	—	—	—	—	—	—
CWAI	AND condition code register, then wait for interrupt	—	X	—	—	—	—	—	—	—
NOP	No operation	X	—	—	—	—	—	—	—	—
ORCC	OR condition code register	—	X	—	—	—	—	—	—	—
JMP	Jump	—	—	X	X	X	X	X	X	X
JSR	Jump to subroutine	—	—	X	X	X	X	X	X	X
RTI	Return from interrupt	X	—	—	—	—	—	—	—	—
RTS	Return from subroutine	X	—	—	—	—	—	—	—	—
SWI, SWI2, SWI3	Software interrupt (absolute indirect)	X	—	—	—	—	—	—	—	—
SYNC	Synchronize with interrupt line	X	—	—	—	—	—	—	—	—

Color. VP-590 add-on Color Board allows program control of 8 brilliant colors for graphics, color games. Plus 4 selectable background colors. Includes sockets for 2 auxiliary keypads (VP-580). $69.*

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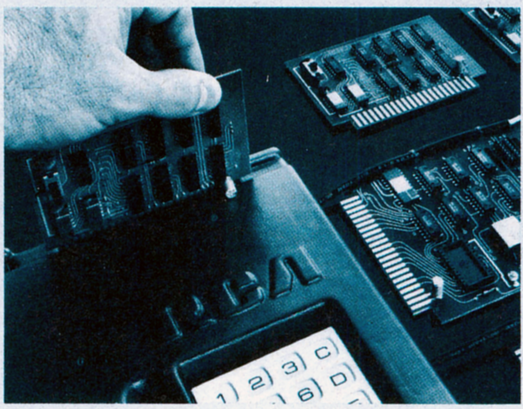

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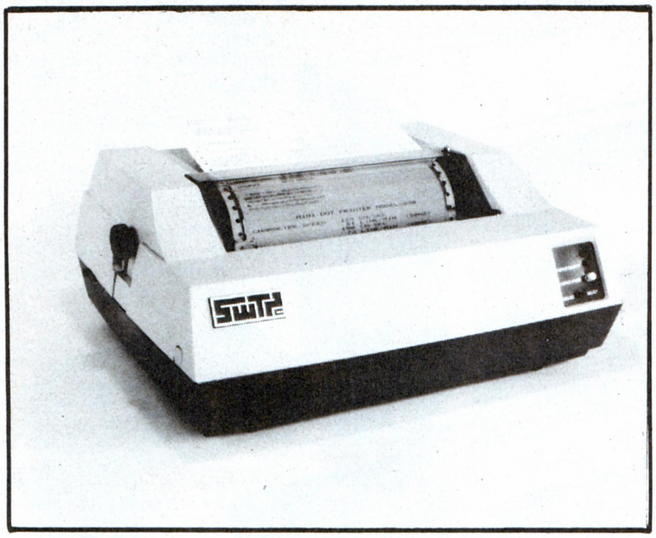

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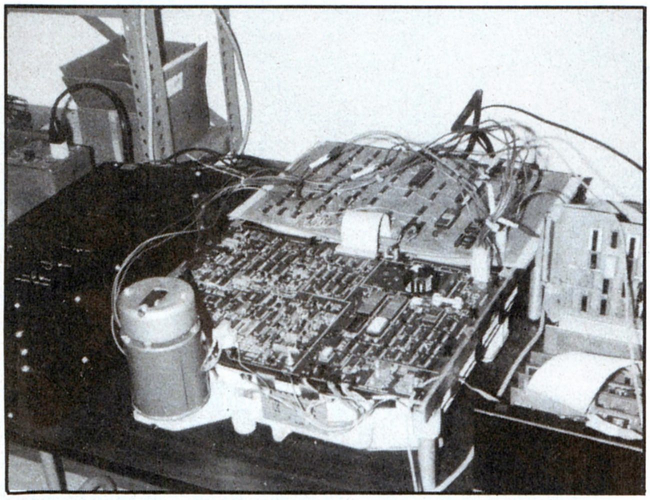

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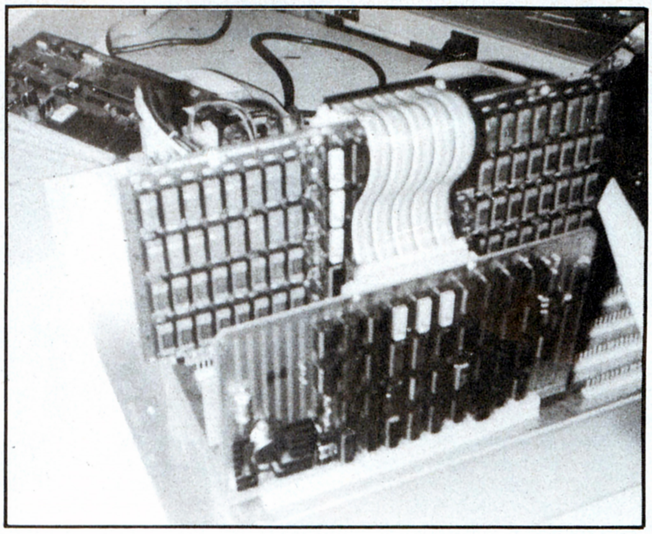

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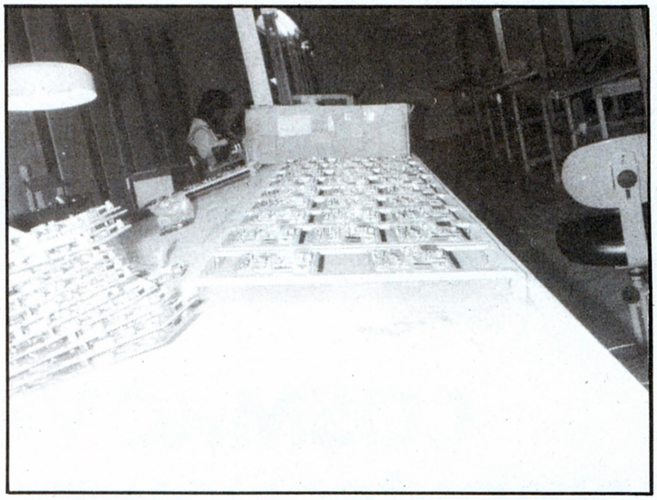

PHOTO 9

MEMORY MANAGEMENT

Years ago a programmer's adage was "Keep as little in memory as possible." This was primarily due to the cost and inadequacy of existing memory systems. However, with the growth of LSI technology, memory prices have come down and processing speeds have gone up. Therefore it is cost effective to have as much internal memory as the system can correctly address. Usually an 8-bit system is designed to address only up to 64K bytes of memory. However, due to the unique design of the 6809 and the use of large memory arrays, Photo 8, Southwest is able to provide up to 384K of onboard user memory.

The memory arrays, shown in the photo, are designed and built by Motorola as is the array controller shown. Using the large memory arrays and the intelligent controller, the system software determines user needs on a multi-user system and parcels out needed memory. The multi-user function therefore becomes a function of both the hardware and software.

FURNITURE IS PART OF THE SYSTEM

One of the things often overlooked by those who design systems is the furniture it fits in. Because Southwest is a multifaceted company, they are able to design and build the furniture that meets their system. As shown in Photo 3 they offer a complete line of furniture from an operator's desk, printer stand, to extra terminal stands. All designed with the modern office in mind.

One unique feature of the desk is that the processor is hidden from view below the disk shelves. Provisions have been made to mount the reset switch under the table top for easy access by the operator. Also important is that sufficient ventilation has been provided for the CPU and disk systems.

SUMMARY

Today there are very few companies offering the end user the option of spending $3,500 to $12,000 for a system and having a high degree of expandability and flexibilty. Southwest Technical Products Corporation, 219 W. Rhapsody, San Antonio, TX 78216, (512) 344-0241, has built its reputation on the flexibility of its systems, and with the introduction of the 6809 line has expanded this philosophy even further.

According to company president Dan Meyer, "We can't be all things to all people, but we can offer a number of alternatives and solutions. After all, solving problems is our business and we like to think we are doing it better than anyone else."

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By Dr. Jack Spencer-Jones

Large corporations have used management science techniques for many years; however, very little has been done to introduce the small businessman to the use of computer-based decision-making models.

One reason was that the use of computers was, for economic reasons, limited to the large corporations. A trend was established by time-sharing systems followed by "intelligent front ends" and then by "desk-top" minicomputers. However, the costs of most of these systems were out of the reach of small businessmen.

The rapidly accelerating use of microcomputers with a decline in their costs have made the use of computer models feasible for the small businessman, provided that the scale of the models is compatible with the limitations of a microcomputer. The author considered scaling down some of the "classical" management science models such as the Simplex linear programming routine, or some of the statistical routines from existing library routines, but these were rejected as being too lengthy and complex.

Finally, the author selected the trade-off matrix as the basis for the model since the concepts are simple, and the input data are easily organized. The trade-off matrix is somewhat similar to payoff and mini-max matrices.

THE TRADE-OFF MATRIX

The factors in many decision-making problems can be reduced to a listing of options and parameters. These can then be quantified and evaluated in a simple trade-off matrix. For example:

The assistant to the president of a company has caused several department heads to complain that the assistant is exercising the authority and decision-making functions of the president because the president is too busy to monitor the day-to-day operation of the company. The president's options are:

1. Restrict the assistant's responsibilities and authority to those of a staff position, in which case the president would have to re-assume some of the authority delegated to the assistant.
2. Change the assistant's function to a line function (e.g., chief of operations).
3. Leave the situation as it is.

In matrix form, the problem could be presented thus:

Option Number	Pres. Time	Cost to Company	Improv. in Joint Perf.	Dept. Heads Acceptance	Avg. Rank
1	3	2	1	1	1.75
2	2	3	2	2	2.25
3	1	1	3	3	2.0

In this case, each option is ranked from one to three with one implying the first preference and three the third preference. The ranks are then summed and averaged for each option. In this case, the optimum option is that with the lowest average rank; number one. In this simple case, the parameters are assumed to have equal weights or measures of importance and the ranks are in ascending order; i.e., the assumption is made that no two options (for a given parameter) have the same weights.

Note that the inputs to the matrix require a qualitative evaluation of each parameter rank. However, this qualitative aspect does not detract from the value of the method. In fact, all decision-making models require some qualitative analysis, but the analysis is made in a logical and formalized manner. This approach is infinitely better than a random technique such as "mulling over the facts." However, the trade-off matrix and other decision-making models cannot compensate for irrational inputs to the models.

PARAMETRIC MODELS

Parametric models are concerned with sensitivity analysis, or the partial derivatives of a function. Given a function of the form

$$Ax + By + Cz + Dm + En = R$$

the question is asked, "What is the effect on R of changes in A when B, C, D, and E are constant, and what is the effect on R of changes in B when A, C, D, and E are constant, and so on?"

This approach can be applied to the trade-off matrix after an optimum option has been determined by tabulating the effect on the weighted average rank of changes in the ranks assigned to the parameters in the optimum case. This will then indicate to the analyst the sensitivity of each parameter. For simplicity, the partial derivative of a parameter is expressed as a percentage of the nominal value. In the general form

$$Ax + By + Cz + Dm + En = R$$

each coefficient is varied plus or minus P percent in increments of S percent, and the effect on R is tabulated. If for example, $x=2$, $Y=3$, $Z=4$, $M=5$, $n=6$, $A=8$, $B=5$, $C=3$, $D=4$, $E=2$, then in the nominal case

$$\begin{aligned} R &= 8(2) + 5(3) + 3(4) + 4(5) + 2(6) \\ &= 16 + 15 + 12 + 20 + 12 \\ &= 75 \end{aligned}$$

If A is changed by plus 25 percent

$$\begin{aligned} R &= 20 + 15 + 12 + 20 + 12 \\ &= 79 \end{aligned}$$

or the change in R is 5.33 percent. One can see that even in this simple example that if each coefficient is varied say plus and minus 10 percent in increments of 1 percent, many computations are required. The computer is particularly useful for this type of iterative computation.

A General Purpose Decision-Making Model for Small Business

GENERALIZED MODEL

The generalized model has two phases: Phase 1, the Trade-off Matrix; Phase 2, Parametric Sensitivity Analysis.

Table 1.

Phase 1 - Trade-off Matrix

J = 1 To M

Parameter / Option	1	2	3	. . .	M	Weighted Average Rank
Weight	W_1	W_2	W_3		W_M	
1	R_{11}	R_{12}	R_{13}		R_{1M}	A_1
2	R_{21}	R_{22}	R_{23}		R_{2M}	A_2
3	R_{31}	R_{32}	R_{33}		R_{3M}	A_3
. . .						. . .
N	R_{N1}	R_{N2}	R_{N3}		R_{NM}	A_N

I = 1 TO N

WEIGHTED AVERAGE RANKS = $\left. A_I \right|_{I=1}^{I=N} = \frac{1}{M} \sum_{\substack{I=1\\J=1}}^{\substack{J=M\\I=N}} R_{IJ}W_J$

OPTIMUM OPTION = MAX (OR MIN) A_I

The general form of the trade-off matrix is shown in Table 1. This matrix is in the generally accepted form where the row subscripts are indicated first and the column subscripts are indicated second. Thus rank R_{32} is in the third row and second column.

In the matrix, N = the number of options, M = the number of parameters, W_1 through W_M = the parameter weights, and R_{11} through R_{NM} = the ranks.

Since, in the general case, the optimum weighted average rank could be either a maximum or a minimum, a maximum or a minimum must be specified.

The weighted average ranks are labeled A_1 through A_N. The index for the matrix columns is J (range 1 to M), and the index for the matrix rows is I (range 1 to N). The outputs from the model are: the number of the optimum option (i.e., I where I = N or the maximum of minimum A_I), the optimum parameter ranks (R_{11} through R_{IM} for the optimum I as above), and all the weighted average ranks (A_1 through A_N). The weighted average ranks for all the options are printed so that the optimum can be compared with the others. The ranks of the optimum parameter are already known but they are printed for easy reference.

For the optimum option, the weighted average rank

$$A = \frac{1}{M} \sum_{J=1}^{M} R_J W_J$$

where R_J are the optimum parameter ranks. Each optimum parameter rank is varied, in turn, plus and minus P percent in increments of S percent to yield (2P/S + 1)M values. These values are then tabulated. The required inputs to the model are the percentage variation P and the increment S. The model output is a table of weighted averages where the nominal value (no deviation) is the same for all parameters. For convenience, the deviation is expressed as a factor ranging from 1 − P/100 to 1 + P/100. The nominal values then have a deviation factor of 1.

Table 2.

Algorithm for Incrementing from -10 percent to +10 percent

```
   B = Initial value   = 0 percent value = A(11)
 A(1) = .89B + .01B    = .90B                 = -10 percent
 A(2) = .89B + .02B    = .91B                 = -9 percent
   .
   .
   .
A(11) = .89B + .11B    = 1.00B                = ±0 percent
A(12) = .89B + .12B    = 1.01B                = +1 percent
   .
   .
   .
A(21) = .89B + .21B    = 1.10B                = +10 percent
 A(I) = .89B + (I/100)B                       = (I - 11) percent
```

Note: The first value is 90 percent of B, but since 1 percent is being added, the constant is (.90 - .01)B = .89B.

A specific example of the algorithm for incrementing from −10% to +10% is shown in Table 2. In the general case, when the percentage variation is P and the increment is S, the number of values for each parameter is 2PS + 1; i.e. the number of values in a column. The first value is (100 − P) percent of B where B is the nominal value. Since the increment being added is S percent, the constant is (100 − P − S)B. Then

$$A(I) = \left(\frac{100 - P - S}{100}\right)B + \left(\frac{IS}{100}\right)B$$

where I, the index, has the range 2P/S+1. For example, when P = 20 percent and S = 5 percent, the range of I is from 1 to 9. Then in this example,

$$\begin{aligned} A(1) &= \left(\frac{100 - 20 - 5}{100}\right)B + \left(\frac{1 \times 5}{100}\right)B \\ &= .75B + .05B = .80B = -20 \text{ percent} \\ A(5) &= .75B + .25B = 1.00B = \pm\ 0 \text{ percent} \\ A(9) &= .75B + .45B = 1.20B = +20 \text{ percent} \end{aligned}$$

COMPUTER PROGRAM

The computer program, Listing 1, parallels the model just described. For ease of correlation, the model algebraic notation is used in the program.

The microcomputer equipment used was an Imsai 8080 processor with 32 kilobytes of memory, a North Star mini-floppy disk drive (single disk), and a Decwriter (Digital Equipment Corporation) printer. The programming language is North Star Disk BASIC.

The program includes the capability to perform a sensitivity analysis on any or all of the options in addition to the optimum option. This capability was included since two or more options could have the same weighted average rank, and normally only the first maximum or minimum would be printed. In any event, the analyst could be interested in a sensitivity analysis of options other than the optimum.

Note that the input to the program is made in response to "prompt" messages. When the input data are complete, the program runs without further user action, and the Phase 1 results are printed. Prompt messages then ask for the Phase 2 inputs. The program continues, and prints a table of weighted values for the optimum parameter. A prompt message then questions whether or not analysis of another option is required (YES or NO input).

EXAMPLE PROBLEM

The following is an example of the application of the model to a "real-world" situation; i.e., a prospective purchaser of a business wishes to evaluate several candidates. In this example, the business required is a travel agency. Four agencies are compared and twenty-three parameters have been defined. A description of each parameter is not included due to space limitations; however, the names of the parameters are sufficient to indicate the factors that are to be considered.

Table 3.

Parameter Summary

No.	Parameter	Weight
1	Years in operation	9
2	Potential for growth	5
3	Good address	5
4	Geographic location	8
5	Permanence of office	7
6	Lease	6
7	Potential market mix	3
8	Size of office	6
9	Physical plant	2
10	Signs	3
11	Ground floor	7
12	Office activity	2
13	Personnel	5
14	Office systems and accounting	1
15	Appointments	8
16	Reputation with airlines, tour operators, etc.	3
17	Mailing list	2
18	Repeat clients	3
19	Form of ownership	2
20	Volume of business	9
21	Net profit	8
22	Current market mix	3
23	Efficiency improvements	2

Table 4.

Travel Agency Evaluation

Parameter	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Option Weight	9	5	5	8	7	6	3	6	2	3	7	2	5	1	8	3	2	3	2	9	8	3	2
1	5	2	7	6	4	4	4	9	3	7	8	9	4	6	9	9	8	7	5	8	7	7	3
2	4	3	5	7	5	5	5	7	4	7	8	9	7	8	9	7	8	9	8	9	8	9	2
3	3	5	7	5	7	7	6	8	7	6	8	7	8	9	7	5	5	4	8	7	5	2	1
4	1	7	6	5	8	8	7	7	9	4	7	2	4	3	6	2	4	3	5	9	3	4	7

Parameter Summary

A summary listing of the parameters with assigned numbers and weights is shown in Table 3.

Trade-off Matrix

The matrix of parameters and options is shown in Table 4. The weights are repeated from Table 3, and ranks are assigned in accordance with a hypothetical assessment of each parameter for each agency with due attention to the interrelationship of the parameters; e.g., age of agency versus potential for growth.

Sample Run

A sample run is shown in Figure 1. Note that a maximum weighted average rank was indicated, the optimum option is number 2, and that a parametric analysis was selected for both the optimum option and for the next highest, number 1.

Evaluation of Results

An examination of the weighted average ranks shows that the optimum option number 2 is significantly superior to the other options. A comparison of the maximum deviations of option number 2 with those for option number 3, shows that the minimum values of option number 2 do not equal the maximum values for number 1; i.e., the 20 percent deviation did not produce any overlap. This again indicates the significant superiority of number 1.

The most sensitive parameter is number 20 (volume of business). Intuitively, this is not surprising, and the weight and ranks assigned to that parameter in Table 4 substantiate the result. An examination of the ranks assigned to parameter number 1 (years in operation) and the fact that it has a comparable weight, raises the question, "Should the ranks for parameter number 1 be increased?"

If the user decides to increase these numbers, he changes the input and runs the case again. Note that parameters that have equal values at the maximum or minimum deviation factor do not necessarily have the same values at intermediate points. For example, compare parameters number 1 and 5 (optimum option), which have the same value at the minimum deviation factor point. The maximum values and many intermediate values do not agree; i.e., the relationship between the deviation factor and the parameter value is nonlinear. After the user has studied the results, he could simplify the problem by eliminating the parameters that have been shown to be relatively insensitive, and re-run the program using only the most sensitive parameters.☐

ACKNOWLEDGEMENT

The author wishes to acknowledge the help of Mr. David D. Blair. His assistance with the computer programming and the use of his equipment greatly facilitated the development of the program.

Program follows

LISTING 1

```
1000  REM   * * * DECISION MATRIX PROGRAM * * *
1010  REM   * BY D. BLAIR AND J. SPENCER-JONES
1020  INPUT "ENTER A ZERO FOR MIN OR A ONE FOR MAX : ",F
1030  INPUT "HOW MANY PARAMETERS TO CONSIDER : ", M
1040  INPUT "HOW MANY OPTIONS TO CONSIDER : ", N
1050  DIM A(N),W(M),R(N,M),R1(M)
1060  REM - ENTER WEIGHTING FACTORS
1070  FOR I=1 TO M
1080    PRINT "WEIGHTING FACTOR FOR PARAMETER # ",I,
1090    INPUT " : ",W(I)
1100  NEXT I
1110  PRINT
1120  PRINT
1130  REM - ENTER RANKS
1140  FOR I= 1 TO N
1150    PRINT "FOR OPTION #",I
1160    FOR J= 1 TO M
1170      PRINT "RANK OF PARAMETER #",J,
1180      INPUT " : ",R(I,J)
1190    NEXT J
1200    PRINT
1210  NEXT I
1220  PRINT
1230  PRINT
1240  REM - SUMMATION OF PRODUCTS
1250  FOR I= 1 TO N
1260    LET A(I)=0
1270    FOR J=1 TO M
1280      LET A(I)=A(I)+W(J)*R(I,J)
1290    NEXT J
1300  NEXT I
1310  REM - FIND MIN OR MAX
1320  LET T= A(1)
1330  LET O=1
1340  FOR I= 1 TO N
1350    IF F=1 THEN 1400
1360    IF A(I)>=T THEN 1390
1370    LET T=A(I)
1380    LET O=I
1390    GOTO 1440
1400    IF A(I)<=T THEN 1430
1410    LET T=A(I)
1420    LET O=I
1430    REM
1440  NEXT I
1450  REM - COMPUTE AVERAGE
1460  FOR I=1 TO N
1470    LET A(I)=A(I)/M
1480  NEXT I
1490  PRINT
1500  PRINT "OPTIMUM OPTION IS : ",O
1510  PRINT
1520  PRINT "OPTIMUM PARAMETER RANKS ARE :"
1530  FOR K=1 TO M
1540    PRINT %7F2,R(O,K),
1550  NEXT K
1560  PRINT
1570  PRINT
1580  PRINT "OPTIMUM WEIGHTED AVERAGE IS :",%5F2,A(O)
1590  PRINT
1600  PRINT "WEIGHTED AVERAGE RANKS ARE :"
1610  FOR I=1 TO N
1620    PRINT %7F2,A(I),
1630  NEXT I
1640  PRINT
1650  REM * * * PARAMETRIC SENSITIVITY PHASE * * *
1660  LET N=M
1670  FOR I=1 TO 3\PRINT\NEXT
1680  PRINT "* * * PARAMETRIC SENSITIVITY ANALYSIS * * *"\PRINT
1690  INPUT "MAXIMUM DEVIATION IN PERCENT : ",P
1700  INPUT "INCREMENT IN PERCENT : ",S
1710  LET L=-15
1720  PRINT
1730  LET L=L+16
1740  IF N<16 THEN 1770
1750  LET M=L+14
1760  IF M>N THEN M=N
1770  X=(7*(M-L)-24)/2
1780  IF X<0 THEN X=10 ELSE X=X+10
1790  PRINT TAB(INT(X)),"========================="
1800  PRINT  TAB(INT(X)),"TABLE OF WEIGHTED VALUES"
1810  PRINT TAB(INT(X)),"========================="
1820  PRINT
1830  X=(7*(M-L)-22)/2
1840  IF X<0 THEN X=10 ELSE X=X+10
1850  PRINT "DEV. ",TAB(INT(X)),"PARAMETER BEING VARIED"
1860  PRINT "FACTOR",TAB(12),
1870  FOR I=L TO M
1880    PRINT " #",%2I,I,"    ",
1890  NEXT I
1900  PRINT
1910  FOR I=1 TO (M-L)*7+17
1920    PRINT "-",
1930  NEXT I
1940  PRINT
1950  FOR A=1 TO 2*P/S+1
1960  REM - DEV. COLUMN
1970    PRINT %4F2,((100-P-S)/100)+A*S/100,TAB(10),
1980  FOR B=L TO M
1990      GOSUB 2140
2000      PRINT %7F2,X,
2010    NEXT B
2020    PRINT
2030  NEXT A
2040  PRINT
2050  IF M<N THEN 1720
2060  PRINT
2070  PRINT
```

```
2080  INPUT "IS ANALYSIS OF ANOTHER OPTION REQUIRED? ",A$
2090  IF A$(1,1)="N" THEN 2120
2100  INPUT "ENTER NUMBER OF OPTION : ",O
2110  GOTO 1710
2120  END
2130  REM - COMPUTATION OF AVERAGE WITH DEVIATION
2140  FOR I=1 TO N
2150  REM - OPTIMUM RANKS
2160    LET R1(I)=R(O,I)
2170  NEXT I
2180  REM - DEVIATION IN ONE PARAMETER RANK
2190  LET R1(B)=R1(B)*((100-P-S)/100)+(A*S/100)*R1(B)
2200  LET X=0
2210  FOR I=1 TO N
2220  REM - SUM OF RANK*WEIGHT PRODUCTS
2230    LET X=X+R1(I)*W(I)
2240  NEXT I
2250  REM - AVERAGE
2260  LET X=X/N
2270  RETURN
READY
```

LISTING 2

```
RUN (CASE #3 -- TRAVEL AGENCY EVALUATION)

ENTER A ZERO FOR MIN OR A ONE FOR MAX : 1
HOW MANY PARAMETERS TO CONSIDER : 23
HOW MANY OPTIONS TO CONSIDER : 4
WEIGHTING FACTOR FOR PARAMETER #  1 : 9
WEIGHTING FACTOR FOR PARAMETER #  2 : 5
WEIGHTING FACTOR FOR PARAMETER #  3 : 5
WEIGHTING FACTOR FOR PARAMETER #  4 : 8
WEIGHTING FACTOR FOR PARAMETER #  5 : 7
WEIGHTING FACTOR FOR PARAMETER #  6 : 6
WEIGHTING FACTOR FOR PARAMETER #  7 : 3
WEIGHTING FACTOR FOR PARAMETER #  8 : 6
WEIGHTING FACTOR FOR PARAMETER #  9 : 2
WEIGHTING FACTOR FOR PARAMETER # 10 : 3
WEIGHTING FACTOR FOR PARAMETER # 11 : 7
WEIGHTING FACTOR FOR PARAMETER # 12 : 2
WEIGHTING FACTOR FOR PARAMETER # 13 : 5
WEIGHTING FACTOR FOR PARAMETER # 14 : 1
WEIGHTING FACTOR FOR PARAMETER # 15 : 8
WEIGHTING FACTOR FOR PARAMETER # 16 : 3
WEIGHTING FACTOR FOR PARAMETER # 17 : 2
WEIGHTING FACTOR FOR PARAMETER # 18 : 3
WEIGHTING FACTOR FOR PARAMETER # 19 : 2
WEIGHTING FACTOR FOR PARAMETER # 20 : 9
WEIGHTING FACTOR FOR PARAMETER # 21 : 8
WEIGHTING FACTOR FOR PARAMETER # 22 : 3
WEIGHTING FACTOR FOR PARAMETER # 23 : 2
```

```
OPTIMUM OPTION IS :  2

OPTIMUM PARAMETER RANKS ARE :
   4.00   3.00   5.00   7.00   5.00   5.00   5.00   7.00   4.00   7.00   8.00   9.00   7.00   8.00   9.00   7.00   8.00
   9.00   8.00   9.00   8.00   9.00   2.00

OPTIMUM WEIGHTED AVERAGE IS :31.65

WEIGHTED AVERAGE RANKS ARE :
  29.74  31.65  28.48  26.04


* * * PARAMETRIC SENSITIVITY ANALYSIS * * *


MAXIMUM DEVIATION IN PERCENT : 10
INCREMENT IN PERCENT : 1

                                                  ==========================
                                                  TABLE OF WEIGHTED VALUES
                                                  ==========================

DEV.                                               PARAMETER BEING VARIED
FACTOR      # 1    # 2    # 3    # 4    # 5    # 6    # 7    # 8    # 9    #10    #11    #12    #13    #14    #15
-----------------------------------------------------------------------------------------------------------------
  .90      31.50  31.59  31.54  31.41  31.50  31.52  31.59  31.47  31.62  31.56  31.41  31.57  31.50  31.62  31.34
  .91      31.51  31.59  31.55  31.43  31.52  31.53  31.59  31.49  31.62  31.57  31.43  31.58  31.52  31.62  31.37
  .92      31.53  31.60  31.57  31.46  31.53  31.55  31.60  31.51  31.62  31.58  31.46  31.59  31.53  31.62  31.40
  .93      31.54  31.61  31.58  31.48  31.55  31.56  31.61  31.52  31.63  31.59  31.48  31.60  31.55  31.63  31.43
  .94      31.56  31.61  31.59  31.51  31.56  31.57  31.61  31.54  31.63  31.60  31.51  31.61  31.56  31.63  31.46
  .95      31.57  31.62  31.60  31.53  31.58  31.59  31.62  31.56  31.63  31.61  31.53  31.61  31.58  31.63  31.50
  .96      31.59  31.63  31.61  31.55  31.59  31.60  31.63  31.58  31.64  31.62  31.55  31.62  31.59  31.64  31.53
  .97      31.61  31.63  31.62  31.58  31.61  31.61  31.63  31.60  31.64  31.62  31.58  31.63  31.61  31.64  31.56
  .98      31.62  31.64  31.63  31.60  31.62  31.63  31.64  31.62  31.65  31.63  31.60  31.64  31.62  31.65  31.59
  .99      31.64  31.65  31.64  31.63  31.64  31.64  31.65  31.63  31.65  31.64  31.63  31.64  31.64  31.65  31.62
 1.00      31.65  31.65  31.65  31.65  31.65  31.65  31.65  31.65  31.65  31.65  31.65  31.65  31.65  31.65  31.65
 1.01      31.67  31.66  31.66  31.68  31.67  31.67  31.66  31.67  31.66  31.66  31.68  31.66  31.67  31.66  31.68
 1.02      31.68  31.67  31.67  31.70  31.68  31.68  31.67  31.69  31.66  31.67  31.70  31.67  31.68  31.66  31.71
 1.03      31.70  31.67  31.68  31.73  31.70  31.69  31.67  31.71  31.66  31.68  31.73  31.68  31.70  31.66  31.75
 1.04      31.71  31.68  31.70  31.75  31.71  31.70  31.68  31.73  31.67  31.69  31.75  31.68  31.71  31.67  31.78
 1.05      31.73  31.68  31.71  31.77  31.73  31.72  31.68  31.74  31.67  31.70  31.77  31.69  31.73  31.67  31.81
 1.06      31.75  31.69  31.72  31.80  31.74  31.73  31.69  31.76  31.67  31.71  31.80  31.70  31.74  31.67  31.84
 1.07      31.76  31.70  31.73  31.82  31.76  31.74  31.70  31.78  31.68  31.72  31.82  31.71  31.76  31.68  31.87
 1.08      31.78  31.70  31.74  31.85  31.77  31.76  31.70  31.80  31.68  31.73  31.85  31.71  31.77  31.68  31.90
 1.09      31.79  31.71  31.75  31.87  31.79  31.77  31.71  31.82  31.68  31.73  31.87  31.72  31.79  31.68  31.93
 1.10      31.81  31.72  31.76  31.90  31.80  31.78  31.72  31.83  31.69  31.74  31.90  31.73  31.80  31.69  31.97
```

```
                        ==========================
                        TABLE OF WEIGHTED VALUES
                        ==========================

DEV.                   PARAMETER BEING VARIED
FACTOR        #16     #17     #18     #19     #20     #21     #22     #23
---------------------------------------------------------------------------
 .90         31.56   31.58   31.53   31.58   31.30   31.37   31.53   31.63
 .91         31.57   31.59   31.55   31.59   31.34   31.40   31.55   31.64
 .92         31.58   31.60   31.56   31.60   31.37   31.43   31.56   31.64
 .93         31.59   31.60   31.57   31.60   31.41   31.46   31.57   31.64
 .94         31.60   31.61   31.58   31.61   31.44   31.49   31.58   31.64
 .95         31.61   31.62   31.59   31.62   31.48   31.51   31.59   31.64
 .96         31.62   31.62   31.61   31.62   31.51   31.54   31.61   31.65
 .97         31.62   31.63   31.62   31.63   31.55   31.57   31.62   31.65
 .98         31.63   31.64   31.63   31.64   31.58   31.60   31.63   31.65
 .99         31.64   31.65   31.64   31.65   31.62   31.62   31.64   31.65
1.00         31.65   31.65   31.65   31.65   31.65   31.65   31.65   31.65
1.01         31.66   31.66   31.66   31.66   31.69   31.68   31.66   31.65
1.02         31.67   31.67   31.68   31.67   31.72   31.71   31.68   31.66
1.03         31.68   31.67   31.69   31.67   31.76   31.74   31.69   31.66
1.04         31.69   31.68   31.70   31.68   31.79   31.76   31.70   31.66
1.05         31.70   31.69   31.71   31.69   31.83   31.79   31.71   31.66
1.06         31.71   31.69   31.72   31.69   31.86   31.82   31.72   31.66
1.07         31.72   31.70   31.73   31.70   31.90   31.85   31.73   31.66
1.08         31.73   31.71   31.75   31.71   31.93   31.87   31.75   31.67
1.09         31.73   31.71   31.76   31.71   31.97   31.90   31.76   31.67
1.10         31.74   31.72   31.77   31.72   32.00   31.93   31.77   31.67
```

```
FOR OPTION # 1
RANK OF PARAMETER # 1 : 5
RANK OF PARAMETER # 2 : 2
RANK OF PARAMETER # 3 : 7
RANK OF PARAMETER # 4 : 6
RANK OF PARAMETER # 5 : 4
RANK OF PARAMETER # 6 : 4
RANK OF PARAMETER # 7 : 4
RANK OF PARAMETER # 8 : 9
RANK OF PARAMETER # 9 : 3
RANK OF PARAMETER # 10 : 7
RANK OF PARAMETER # 11 : 8
RANK OF PARAMETER # 12 : 9
RANK OF PARAMETER # 13 : 4
RANK OF PARAMETER # 14 : 6
RANK OF PARAMETER # 15 : 9
RANK OF PARAMETER # 16 : 9
RANK OF PARAMETER # 17 : 8
RANK OF PARAMETER # 18 : 7
RANK OF PARAMETER # 19 : 5
RANK OF PARAMETER # 20 : 8
RANK OF PARAMETER # 21 : 7
RANK OF PARAMETER # 22 : 7
RANK OF PARAMETER # 23 : 3

FOR OPTION # 2
RANK OF PARAMETER # 1 : 4
RANK OF PARAMETER # 2 : 3
RANK OF PARAMETER # 3 : 5
RANK OF PARAMETER # 4 : 7
RANK OF PARAMETER # 5 : 5
RANK OF PARAMETER # 6 : 5
RANK OF PARAMETER # 7 : 5
RANK OF PARAMETER # 8 : 7
RANK OF PARAMETER # 9 : 4
RANK OF PARAMETER # 10 : 7
RANK OF PARAMETER # 11 : 8
RANK OF PARAMETER # 12 : 9
RANK OF PARAMETER # 13 : 7
RANK OF PARAMETER # 14 : 8
RANK OF PARAMETER # 15 : 9
RANK OF PARAMETER # 16 : 7
RANK OF PARAMETER # 17 : 8
RANK OF PARAMETER # 18 : 9
RANK OF PARAMETER # 19 : 8
RANK OF PARAMETER # 20 : 9
RANK OF PARAMETER # 21 : 8
RANK OF PARAMETER # 22 : 9
RANK OF PARAMETER # 23 : 2
```

```
FOR OPTION # 3
RANK OF PARAMETER # 1 : 3
RANK OF PARAMETER # 2 : 5
RANK OF PARAMETER # 3 : 7
RANK OF PARAMETER # 4 : 5
RANK OF PARAMETER # 5 : 7
RANK OF PARAMETER # 6 : 7
RANK OF PARAMETER # 7 : 6
RANK OF PARAMETER # 8 : 8
RANK OF PARAMETER # 9 : 7
RANK OF PARAMETER # 10 : 6
RANK OF PARAMETER # 11 : 8
RANK OF PARAMETER # 12 : 7
RANK OF PARAMETER # 13 : 8
RANK OF PARAMETER # 14 : 9
RANK OF PARAMETER # 15 : 7
RANK OF PARAMETER # 16 : 5
RANK OF PARAMETER # 17 : 5
RANK OF PARAMETER # 18 : 4
RANK OF PARAMETER # 19 : 8
RANK OF PARAMETER # 20 : 7
RANK OF PARAMETER # 21 : 5
RANK OF PARAMETER # 22 : 2
RANK OF PARAMETER # 23 : 1

FOR OPTION # 4
RANK OF PARAMETER # 1 : 1
RANK OF PARAMETER # 2 : 7
RANK OF PARAMETER # 3 : 6
RANK OF PARAMETER # 4 : 5
RANK OF PARAMETER # 5 : 8
RANK OF PARAMETER # 6 : 8
RANK OF PARAMETER # 7 : 7
RANK OF PARAMETER # 8 : 7
RANK OF PARAMETER # 9 : 9
RANK OF PARAMETER # 10 : 4
RANK OF PARAMETER # 11 : 7
RANK OF PARAMETER # 12 : 2
RANK OF PARAMETER # 13 : 4
RANK OF PARAMETER # 14 : 3
RANK OF PARAMETER # 15 : 6
RANK OF PARAMETER # 16 : 2
RANK OF PARAMETER # 17 : 4
RANK OF PARAMETER # 18 : 3
RANK OF PARAMETER # 19 : 5
RANK OF PARAMETER # 20 : 9
RANK OF PARAMETER # 21 : 3
RANK OF PARAMETER # 22 : 4
RANK OF PARAMETER # 23 : 7
```

```
IS ANALYSIS OF ANOTHER OPTION REQUIRED? YES
ENTER NUMBER OF OPTION : 1

                                         ========================
                                          TABLE OF WEIGHTED VALUES
                                         ========================

DEV.                                      PARAMETER BEING VARIED
FACTOR      # 1    # 2    # 3    # 4    # 5    # 6    # 7    # 8    # 9    #10    #11    #12    #13    #14    #15
--------------------------------------------------------------------------------------------------------------------
 .90       29.54  29.70  29.59  29.53  29.62  29.63  29.69  29.50  29.71  29.65  29.50  29.66  29.65  29.71  29.43
 .91       29.56  29.70  29.60  29.55  29.63  29.65  29.69  29.53  29.72  29.66  29.52  29.67  29.66  29.72  29.46
 .92       29.58  29.70  29.62  29.57  29.64  29.66  29.70  29.55  29.72  29.67  29.54  29.68  29.67  29.72  29.49
 .93       29.60  29.71  29.63  29.59  29.65  29.67  29.70  29.57  29.72  29.68  29.57  29.68  29.68  29.72  29.52
 .94       29.62  29.71  29.65  29.61  29.67  29.68  29.71  29.60  29.72  29.68  29.59  29.69  29.69  29.72  29.55
 .95       29.64  29.72  29.66  29.63  29.68  29.69  29.71  29.62  29.73  29.69  29.62  29.70  29.70  29.73  29.58
 .96       29.66  29.72  29.68  29.66  29.69  29.70  29.72  29.65  29.73  29.70  29.64  29.71  29.70  29.73  29.61
 .97       29.68  29.73  29.69  29.68  29.70  29.71  29.72  29.67  29.73  29.71  29.67  29.72  29.71  29.73  29.65
 .98       29.70  29.73  29.71  29.70  29.71  29.72  29.73  29.69  29.73  29.72  29.69  29.72  29.72  29.73  29.68
 .99       29.72  29.73  29.72  29.72  29.73  29.73  29.73  29.72  29.74  29.73  29.71  29.73  29.73  29.74  29.71
1.00       29.74  29.74  29.74  29.74  29.74  29.74  29.74  29.74  29.74  29.74  29.74  29.74  29.74  29.74  29.74
1.01       29.76  29.74  29.75  29.76  29.75  29.75  29.74  29.76  29.74  29.75  29.76  29.75  29.75  29.74  29.77
1.02       29.78  29.75  29.77  29.78  29.76  29.76  29.75  29.79  29.74  29.76  29.79  29.75  29.76  29.74  29.80
1.03       29.80  29.75  29.78  29.80  29.78  29.77  29.75  29.81  29.75  29.77  29.81  29.76  29.77  29.75  29.83
1.04       29.82  29.76  29.80  29.82  29.79  29.78  29.76  29.83  29.75  29.78  29.84  29.77  29.77  29.75  29.86
1.05       29.84  29.76  29.82  29.84  29.80  29.79  29.77  29.86  29.75  29.78  29.86  29.78  29.78  29.75  29.90
1.06       29.86  29.77  29.83  29.86  29.81  29.80  29.77  29.88  29.75  29.79  29.89  29.79  29.79  29.75  29.93
1.07       29.88  29.77  29.85  29.89  29.82  29.81  29.78  29.90  29.76  29.80  29.91  29.79  29.80  29.76  29.96
1.08       29.90  29.77  29.86  29.91  29.84  29.82  29.78  29.93  29.76  29.81  29.93  29.80  29.81  29.76  29.99
1.09       29.92  29.78  29.88  29.93  29.85  29.83  29.79  29.95  29.76  29.82  29.96  29.81  29.82  29.76  30.02
1.10       29.93  29.78  29.89  29.95  29.86  29.84  29.79  29.97  29.77  29.83  29.98  29.82  29.83  29.77  30.05
```

```
                  ==========================
                   TABLE OF WEIGHTED VALUES
                  ==========================

DEV.                  PARAMETER BEING VARIED
FACTOR        #16    #17    #18    #19    #20    #21    #22    #23
--------------------------------------------------------------------
 .90         29.62  29.67  29.65  29.70  29.43  29.50  29.65  29.71
 .91         29.63  29.68  29.66  29.70  29.46  29.52  29.66  29.72
 .92         29.65  29.68  29.67  29.70  29.49  29.54  29.67  29.72
 .93         29.66  29.69  29.68  29.71  29.52  29.57  29.68  29.72
 .94         29.67  29.70  29.68  29.71  29.55  29.59  29.68  29.72
 .95         29.68  29.70  29.69  29.72  29.58  29.62  29.69  29.73
 .96         29.69  29.71  29.70  29.72  29.61  29.64  29.70  29.73
 .97         29.70  29.72  29.71  29.73  29.65  29.67  29.71  29.73
 .98         29.72  29.73  29.72  29.73  29.68  29.69  29.72  29.73
 .99         29.73  29.73  29.73  29.73  29.71  29.71  29.73  29.74
1.00         29.74  29.74  29.74  29.74  29.74  29.74  29.74  29.74
1.01         29.75  29.75  29.75  29.74  29.77  29.76  29.75  29.74
1.02         29.76  29.75  29.76  29.75  29.80  29.79  29.76  29.74
1.03         29.77  29.76  29.77  29.75  29.83  29.81  29.77  29.75
1.04         29.79  29.77  29.78  29.76  29.86  29.84  29.78  29.75
1.05         29.80  29.77  29.78  29.76  29.90  29.86  29.78  29.75
1.06         29.81  29.78  29.79  29.77  29.93  29.89  29.79  29.75
1.07         29.82  29.79  29.80  29.77  29.96  29.91  29.80  29.76
1.08         29.83  29.79  29.81  29.77  29.99  29.93  29.81  29.76
1.09         29.84  29.80  29.82  29.78  30.02  29.96  29.82  29.76
1.10         29.86  29.81  29.83  29.78  30.05  29.98  29.83  29.77

IS ANALYSIS OF ANOTHER OPTION REQUIRED? NO
READY
```

Furniture Completes the System

By Betsy Gilbert, Staff Reporter

Designer furnishings for the office environment are nothing new. The businessperson, like the home owner, shows his individual taste and style through his choice of decoration and furnishings for the office.

What is new is the recent introduction of custom design furniture for the computerized office environment. It was inevitable that an enterprising designer would eventually realize the impact of the computer revolution and come up with furniture to fit the computer operator's esthetic and comfort needs.

In the past two years, a number of companies specializing in the design and sale of computer furniture have opened and the response in the business community has been tremendous. Office managers now have a wide array of designs to choose from, and they're making the computer operator's work surroundings much more pleasant.

Systems Furniture Company of Los Angeles is a relatively new company, but in its short life span it has turned the design and sale of an exclusive line of computer furniture into a lucrative operation. The company's Cupertino, California branch, a subsidiary of Western Micro Systems, has orders coming in increasing volume from the numerous high technology firms in the "Silicon Valley" surrounding Cupertino.

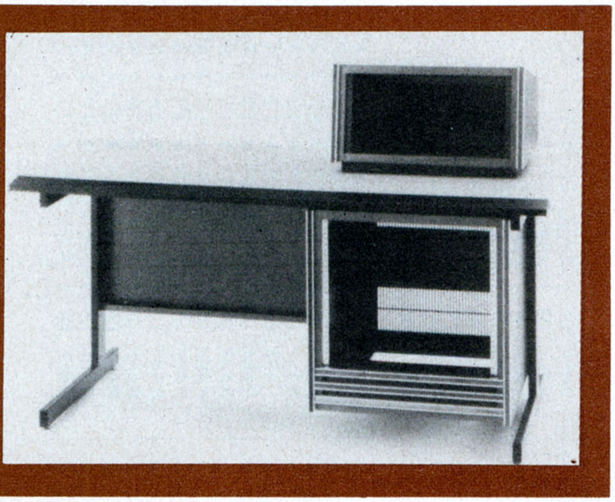
"There's an amazing amount of potential in this kind of business," said salesman Bob Mann of the Cupertino branch. "Standard office furniture isn't designed to accommodate computer equipment and it can be uncomfortable and unpleasant for the operator who has to sit at an ill-designed work space all day long."

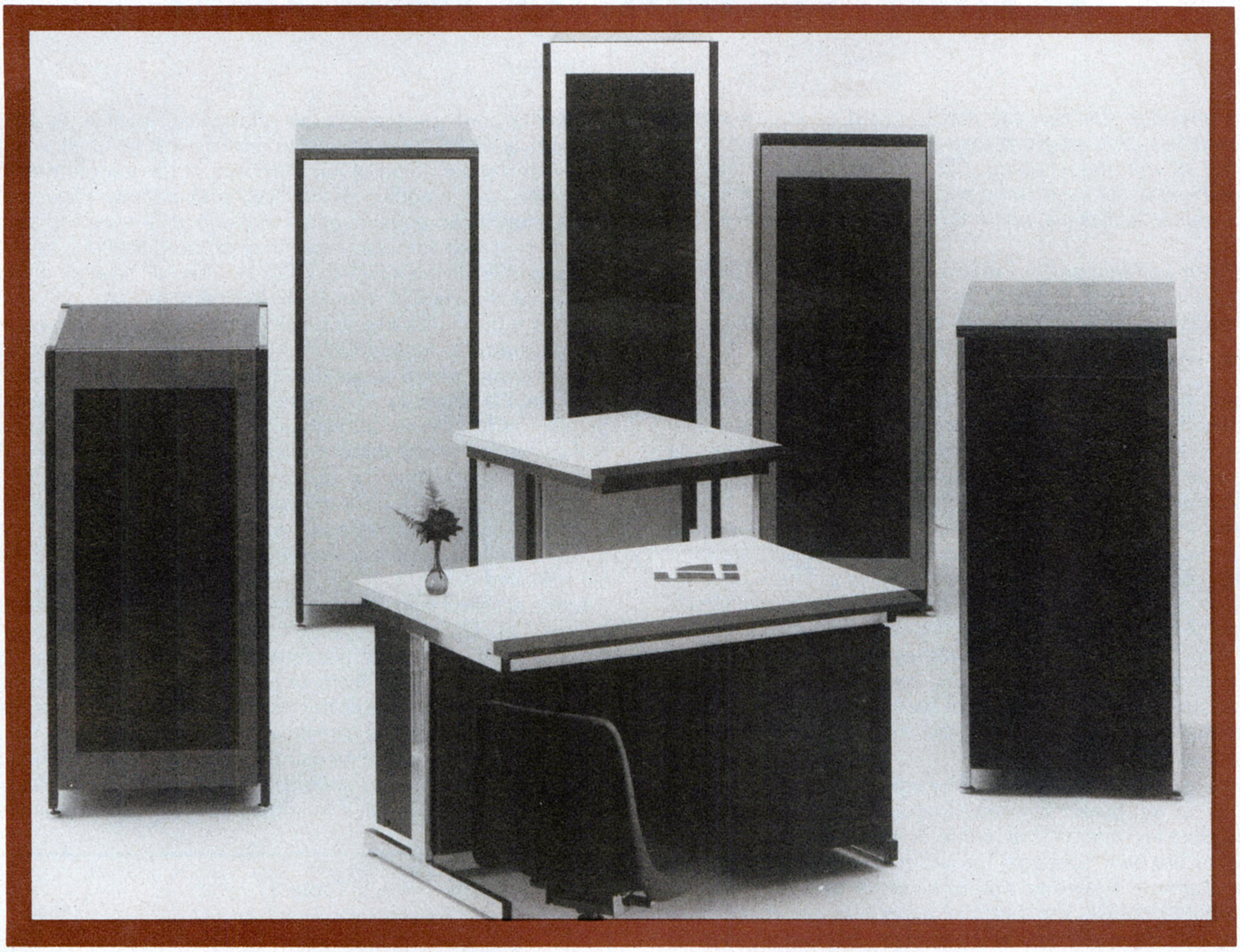
Systems Furniture Company has added modifications and special touches which set its pieces apart from ordinary desks and tables, making them much more suitable to the computer environment.

According to Mann, sales efforts are made to attract the small quantity end user, but the company's major sales target is the larger OEM customer. Apple Computers is that kind of target customer, and it represents Systems Furniture's biggest account.

"We sell them our line of furniture, the design and color of which are unique to Apple, and it allows them to sell a package of their equipment and the furniture to go with it," said Mann. "The equipment looks more attractive to the potential customer if he knows that the furniture he's going to need eventually was designed especially for it."

The designers at Systems work closely with computer manufacturers to keep up with new products. Consequently, they are able to coordinate color and size and generally aim for the highest possible esthetic appeal.





The Systems Furniture Data Desk 1 line consists of three separate modular designed desk groups, accommodating most office computer equipment from the compact to the larger pieces. In addition to the desks, there is a line of computer-printer stands as well as special work station chairs.

Each of the desk groups is available in a variety of sizes and colors to fit the individual office requirements.

For smaller multi-station terminals or word processing stations, Systems Furniture designed the Specialty 1 Data Desk. The piece is small and relatively lightweight, made of particle board and welded steel tubing. It is available with a number of options. The Specialty 1 features an electronic bay designed for mounting floppy disk drives and/or microprocessors.

The Specialty 2 design is geared to the larger workstation needs. It is a heavy piece and its larger size will accommodate two electronic bays fitted in a number of variations between the end pieces.

Designed along similar lines as the Specialty 2, the Specialty 3 comes with a wide variety of options, including vented side panels, front and rear doors, decorative trim, desk drawers and cable ducts.

Systems Furniture printer stands are available in nine separate designs, made especially for several manufacturers' models.

In addition to the Data Desk 1 line, Systems Furniture also builds custom computer room furniture for specific applications and tailors existing components for custom applications.

"Our major function is supplying OEMs with our line," said Mann. "What we like to do is find an OEM just starting out in business. Our in-stock line is usually close enough to what he needs in style and color to make sales easy. Later on, as his customers become more specialized, we can do some custom work for him."

According to Mann, the Apple Computer/Systems Furniture agreement is a prime example of how a small OEM can grow with a little help. "A year ago, not too many people had even heard of Apple," he said. "Now you see their ads in the major computer books and people are talking about them more and more. Having a special line of furniture to go with their equipment certainly boosted their selling power."

Mann sees the OEM business between furniture designers and computer manufacturers getting even bigger in the next few years. "You can't have one without the other, and each serves as a selling point for the other." he said, adding that the styles of computer furniture can be used to accurately track the evolution of computers themselves. "All that used to be around was the big, heavy furniture to go with the heavy, cumbersome equipment. Today, with compact computer systems that can do everything the bigger ones did, the furniture is taking on a little more style, a little more class."☐

Saving Time While Keeping Minutes

By Jon R. Lindsay

For one who has recently incorporated or knows someone who has, this program may ease one corporate nemesis: that of minutes keeping. Though minutes are not required by law, failure to keep accurate and current minutes of corporate activity is not only poor business form, but foolish.

Written in Microsoft's Extended Disk BASIC (MBASIC) on a CP/M based system, the program allows reviewing and editing of the text, as well as saving the text on disk.

INTRODUCTION

If you have recently become incorporated, or know someone who has, you have no doubt already discovered the confusing quagmire of minutes keeping. There isn't a corporate lawyer or advisor anywhere who would recommend disregarding preparation of minutes of corporate activity. Not only do minutes add to the cloak of corporate conduct (if it looks and acts like a corporation, it must be a corporation), but they chronicle all major company activity. These become invaluable documents when the next tax audit comes about.

One of the problems with keeping corporate minutes probably is the "fiddle factor." It becomes too much of a bother to prepare these monthly papers, as well as those for any special activity, e.g. trips, special meetings, etc. It's a fateful decision to elect not to bother because later these records will surely be needed.

Herein lies the beauty of this program. The style, or format, is to be predetermined. The one presented here is modeled after one of the author's minutes formats, with some of his own concepts thrown in. The idea is not that there is a right or wrong way to write up minutes; just that they should convey the essential aspects of the meeting or activity and should be basically complete. Consult an attorney as to whether this form will be adequate.

ABOUT THE PROGRAM

The program is designed to be used with legal size paper (8½" x 14"). That's what is often supplied with the corporate minutes book. However, if standard (8½" x 11") paper is to be used, the heading routine (line 1920) will have to be altered.

The program format consists of three parts: 1) Preamble, 2) Text, and 3) Postscript. The preamble requires input of a) persons attending the meeting or activity, b) location of the meeting, c) date, d) time, e) purpose of the meeting, and f) whether this is a specially called meeting.

This last input request is necessary to allow a waiver of notification, as is frequently required within the by-laws of the corporation. Check your own by-laws as to what are "regular" meetings. Anything other than "scheduled" activity should probably include this waiver. A simple "Y" will automatically fulfill this obligation. Most preamble prompts are self-explanatory. However, typing a "?" will give cursory instruction on the first prompt of the preamble and in the text.

The text portion of the program allows the user some degree of editing and is relatively easy to use after a little practice. To exit from the text, type <*> in the first space of a new line. This gives a command menu so the user can review, edit or return to the text. Review will display what text has already been written. Follow the commands under each display to continue the text (hit return key), review, or edit. There is a <KILL> command to remove any text that might have been saved. One of the purposes of this program is to eliminate any lengthy, drawn out preparation. However, sometimes it can be anticipated that you might want to save the current text for later rereading or modification. In the command list is the <SAVE TEXT>. This will save all of the inputs for the current minutes being prepared.

If this is done, the way to quickly retrieve the file is to enter the program by typing <RUN>. Then enter <*>, forcing the command menu to appear. Use the <GET TEXT> and enter the file name. In the program listing, you'll note the expression <MIN.> is concatenated to the file name. This makes finding saved minutes files easy, in either the CP/M directory or by exiting the program (via typing control "C") and then typing <FILES>. It seems to help dusty memories like mine. When getting a file, just enter the file name; the <MIN.> will be automatically reattached to the name and the file retrieved.

Once satisfied with the text, return to the command menu (type <*>). The report is ready to be typed. Two printing options present: 1) simple printing of text as prepared, or 2) right-justified text. This form of justification can be used by any printer and accomplishes this feat by inserting spaces from the right side of the sentence. This helps set out the text; however, you may want to use the <PRINT COPY> only. Both are available. You should experiment with the placement of the paper so that it will operate within the parameters of the program.

Table 1.

A$() - Line input of text

Q - Sets line marker

LL - Sets number of characters per line

L - Sets screen end-of-line mark

W - Sets number of lines in text

P - Paging

B - Number of characters short of predetermined line length

A - Number of characters in a particular line

C - Counter of blank spaces within line

T - Counts total numbers of characters in line to date

MM - Blanks needed to fill out line

V - Count of character spaces preceding fill-in spaces

F$ - Disk file name

LM$ - Location of meeting

DM$ - Date of meeting

TM$ - Time of day

PM$ - Purpose of meeting

XD$ - Flag for printing waiver

Editing requires that the line number of the line to be modified be entered. The line is reprinted and verification sought. It is then necessary to reenter the entire line, a bit of an inconvenience. Hopefully, you will have little of this line editing to do.

The best way to correct a line with MBASIC is to use the back-up arrow (available on the SOROC 120). Don't use the RUB key is possible since this causes the character to be echoed. This messes up the character count (75/line), since it's hard to see how close to the line marker you're coming.

Table 2.

Line 90 - Clear memory

Line 100 - Set Screen width
Line 110 - Set line length and end-of-line marker

Line 170 - Goto input subroutine meeting parameters
Enter: 1) persons present at meeting

2) Location of meeting

3) Date of meeting
4) Time of day

5) Purpose of meeting

6) If waiver of notice is to be used
Line 200 - Enter text of meeting

Line 290 - Typing < * > will give command menu

Line 360-410 - Select from the command menu
Lines 460-480 - Starts justification routine by first printing preamble

Lines 490-710 - Text right justification routine

Lines 750-760 - Line marker subroutine
Lines 790-930 - Edit routine

Lines 1000-1190 - Review text on screen

Lines 1210-1330 - Print minutes unjustified

Lines 1390-1570 - Save minutes input data and text on disk

Lines 1580-1800 - Read saved minutes and data from disk
Lines 1810-1910 - File deletion routine

Lines 1920-1970 - Heading routine

Lines 1990-2030 - Letterheading routine
Lines 2040-2090 - Input persons present at meeting

Lines 2120-2170 - Preamble input data routine
Lines 2180-2260 - Preamble to printer

Line 2270 - Underlining of meeting purpose
Lines 2290-2340 - Print persons present

Lines 2390-2660 - Printer postscript

The back-up arrow won't echo and the result is a much cleaner line. If a lot of editing *must* be done, e.g. deleting sentences or paragraphs, or numerous words within the text, there's still a way out.

For those using CP/M, simply use the <ED> function. First, return to the CP/M command level. This is done by typing <SYSTEM> (after first saving the file) to exit MBASIC. Files are saved in ASCII and thus can be operated on by the CP/M Editor. Type <ED file name.MIN>, then append it into memory by typing <#A>. The normal edit commands for this editor must be used. If not familiar with them, consult the ED manual.

Be sure to use a small <i> or <s> for input or search commands so that all additions will appear as mixed type. A capital I or S will return all capitals, even though entered as small letters. This may be inconvenient for some but it is quite functional. Anyway, this program was not intended as a word-processor.

Saving text is handled by the program as sequential files. As mentioned earlier, all information will be saved, including those inputs done prior to entering the text. The files are saved as ASCII and thus are easily manipulated or passed to other programs.

The postscript portion of the program is essentially handled by the program. There is really nothing to be done here. It comprises the various finishing of sentences, labels and underlining, and the addition of the waiver.

CONCLUSION

This is a program that attempts to ease the burden of corporate duties in the form of minutes keeping. Supposedly any form would be better than no form, but best yet would be to show a sample of this program output to your corporate advisor for his/her comments and suggestions. It must contain the essential elements of minutes, as determined by someone expert in that field.☐

Program follows

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- It's the big Five.• It's fully documented.
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- It's old fashioned accounting.
- It's source code. (license)
- It's available NOW!

NATIONAL SOFTWARE
EXCHANGE, INC.

If your dealer does not have BTC01, have him write or call National Software Exchange,
Suite 113, 1000 Lake Saint Louis Blvd., Lake Saint Louis, MO 63367,
Telephone (314) 625-2400.

CIRCLE INQUIRY NO. 36

PROGRAM LISTING

```
10 REM          PROGRAM NAME :  <  INCFORM  >
20 REM          PROGRAM FUNCTION : PREPARE MONTHLY BOARD MINUTES
30 REM          WRITTEN BY  JON R. LINDSAY
40 REM          IN  MICROSOFT (CP/M-BASED) EXTENDED DISK BASIC
50 REM          EQUIPMENT: SOROC 120 TERMINAL
60 REM                     DIABLO PRINTER
70 REM                     ICOM DUAL DISK
80 REM                     Z-80 CPU
90 CLEAR 2000
100 WIDTH 100
110 LL=75:L=LL+3: REM   LINE LENGTH
120 PRINTCHR$(27);CHR$(43): REM   CLEAR SCREEN
130 DIM A$(500)
140 PRINTTAB(25);"Corp. Meeting Report"
150 PRINTTAB(25);"===================="
160 PRINT:PRINT
170 GOSUB 2040
180 PRINT
190 PRINT:PRINT
200 PRINT "Type Summary of the Meeting Transaction"
210 PRINT
220 PRINT "Type <  *  >  when finished or a review of text is desired"
230 PRINT
240 PRINT "Line Length of";LL;"is HERE -------------------------------------->"
250 PRINTTAB(L);"|"
260 I=1
270 PRINT I;:LINE INPUT A$(I)
280 Q=Q+1
290 IF A$(I)="*" THEN 340
300 IF A$(I)="?" THEN GOSUB 960:I=I-1
310 IF Q=2 THEN GOSUB 750:Q=0
320 I=I+1:GOTO 270
330 REM              ***********  MENU  **********
340 PRINT CHR$(27);CHR$(43)
350 FOR C=1 TO 4:PRINT CHR$(10):NEXT C
360 PRINT "                     PRINT COPY -------- 1"
370 PRINT "                 JUSTIFIED COPY -------- 2"
380 PRINT "                    REVIEW TEXT -------- 3"
390 PRINT "                 RETURN TO TEXT -------- 4"
400 PRINT "                     SAVE  TEXT -------- 5"
410 PRINT "                       GET TEXT -------- 6"
420 PRINT TAB(44);:FOR X=1TO6:PRINTCHR$(11);:NEXTX:INPUT D
430 IF D<1 OR D>6 THEN 340
440 ON D GOTO 1220,460,1010,1010,1410,1590
450 REM  ****   JUSTIFIED  COPY  ****
460 GOSUB 1990:GOSUB 2180:GOSUB 2290
470 GOSUB 2240
480 GOSUB 2350
490 W=I:P=1
500 FOR I=1 TO W-1
510 K=0:T=0:C=0:V=0
520 A=LEN(A$(I))
530 IF A<LL/1.3 THEN LPRINT A$(I):GOTO 690
540 IF LEFT$(A$(I),3)="   " THEN LPRINT A$(I):GOTO 690
550 B=LL-A
560 FOR MM=1 TO A
570 IF MID$(A$(I),MM,1)=" "  THEN C=C+1
580 NEXT MM
590 MM=C-B
600 FOR J=1 TO A :        REM  EXAMINE LINE AND JUSTIFY
610 T=T+1
620 IF T+K=LL+1 THEN T=0:GOTO 680
630 IF MID$(A$(I),J,1)=" " THEN V=V+1
```

```
1320 IF I/P=56 THEN GOSUB 1930
1330 NEXT I
1340 I=W:        REM  RESTORE (I)
1350 GOSUB 2390:GOSUB 2470
1360 GOTO 340
1370 GOSUB 750:Q=1:GOTO 270
1380 REM
1390 REM          ********  WRITE FILE  **********
1400 REM
1410 PRINT CHR$(27);CHR$(43)
1420 FOR S=1 TO 4:PRINT CHR$(10):NEXT S
1430 INPUT "     WRITE FILE NAME    ";F$
1440 F$=F$+".MIN"
1450 OPEN "O",1,F$
1460 FOR J=1 TO 400:PRINT #1,A$(J)
1470 IF A$(J)="*" THEN 1490
1480 NEXT J
1490 REM
1500 PRINT #1,LM$
1510 PRINT #1,DM$
1520 PRINT #1,TM$
1530 PRINT #1,PM$
1540 PRINT #1,XD$
1550 FOR S=1 TO 10:PRINT #1,F$(S)
1560 IF F$(S)="" THEN CLOSE:GOTO 340
1570 NEXT S
1580 REM          ********  READ FILE  ********
1590 PRINT CHR$(27);CHR$(43)
1600 FOR S=1 TO 4:PRINT CHR$(10):NEXT S
1610 INPUT "     READ FILE NAME    ";F$
1620 F$=F$+".MIN"
1630 OPEN "I",1,F$
1640 FOR S=1 TO 400
1650 LINE INPUT #1,A$(S)
1660 IF A$(S)="*" THEN I1=S:I=S:GOTO 1680
1670 NEXT S
1680 LINE INPUT #1,LM$
1690 LINE INPUT #1,DM$
1700 LINE INPUT #1,TM$
1710 LINE INPUT #1,PM$
1720 LINE INPUT #1,XD$
1730 FOR S=1 TO 10
1740 LINE INPUT #1,F$(S)
1750 IF F$(S)="" THEN 1780
1760 IF EOF(1) THEN 1780
1770 NEXT S
1780 CLOSE
1790 Y=1:W=I:P=1:Z=0
1800 GOTO 340
1810 FOR X=1 TO 4:PRINT CHR$(10):NEXT
1820 PRINT CHR$(27);CHR$(43)
1830 PRINT CHR$(10)
1840 INPUT "WHICH FILE TO DIE";F$
1850 FOR S=1 TO 400:A$(I)=A$(S):IF A$(I)="*" THEN SS=I:NEXT S
1860 PRINT:PRINT "IS FILE  <";F$;">  THE CORRECT ONE ?";:INPUT Y$
1870 IF LEFT$(Y$,1)<>"Y" THEN 340
1880 PRINT:PRINT "ARE YOU ABSOLUTELY POSITIVE ?";:INPUT Y$
1890 IF LEFT$(Y$,1)<>"Y" THEN 340
1900 KILL F$
1910 GOTO 340
1920 REM          *********   HEADING ROUTINE   ************
1930 PRINT CHR$(27);CHR$(43)
1940 PRINT "PLEASE INSERT NEW PAPER AND ALIGN IT"
1950 PRINT:PRINT "THEN HIT THE < RETURN > KEY":WAIT 0,1,1
1960 LPRINT TAB(57);"Page ";P+1:LPRINT:LPRINT:LPRINT:P=P+1
1970 RETURN
1980 REM          ****************************************
1990 LPRINT "                      MINUTES OF A MEETING OF"
```

```
640 IF MID$(A$(I),J,1)=" " AND V<MM THEN 660
650 IF MID$(A$(I),J,1)=" "  AND K<B THEN LPRINT " ";:K=K+1
660 LPRINT MID$(A$(I),J,1);
670 NEXT J
680 LPRINT
690 IF I=38 THEN GOSUB 1930
700 IF I/P=56 THEN GOSUB 1930
710 NEXT I
720 I=W
730 GOSUB 2390:GOSUB 2470
740 GOTO 340:   REM  RETURN TO MENU
750 PRINTTAB(L);"|":    REM  LINE MARKER
760 RETURN
770 PRINT:PRINT:PRINT
780 REM
790 REM  ***************         EDIT  TEXT        *********************
800 REM
810 W=I
820 INPUT "WHICH LINE # ";I
830 PRINT: PRINT A$(I)
840 INPUT "CORRECT LINE";Z$
850 IF Z$="*" THEN I=W:GOTO 340
860 IF LEFT$(Z$,1)<>"N" THEN GOTO 880
870 GOTO 820
880 PRINT"TYPE NEW LINE"
890 PRINT : GOSUB 750:  REM  LINE MARKER
900 PRINT I;:LINE INPUT A$(I)
910 INPUT "IS THERE ANOTHER LINE";Z$
920 IF LEFT$(Z$,1)<>"Y" THEN I=W:GOTO 340
930 GOTO 820
940 END
950 REM          CONTROL FUNCTIONS
960 PRINT:PRINT "TYPE   ' * '  IF TEXT FINISHED"
970 PRINT "TYPE THE ";CHR$(64);" SYMBOL TO DELETE LINE"
980 PRINT
990 RETURN
1000 REM          TEXT REVIEW
1010 PRINT CHR$(27);CHR$(43)
1020 Y=1:W=I:P=1:Z=0
1030 FOR I1=Y TO P*12
1040 IF A$(I1)="*" THEN I=I1:GOTO 1080
1050 IF I1=W THEN 1080
1060 PRINT I1;A$(I1)
1070 NEXT I1
1080 PRINT:PRINT
1090 PRINT "'RETURN'-CONTINUE   3-REVIEW   4-EDIT   5-TEXT   6-KILL";:
1100 INPUT Z
1110 IF Z=0 THEN 1170
1120 I=W:    REM     RESTORE SIGN OUT (I)
1130 IF Z=3 THEN  340
1140 IF Z=4 THEN 810
1150 IF Z=5 THEN 1370
1160 IF Z=6 THEN 1820
1170 Y=P*12
1180 P=P+1
1190 GOTO 1030
1200 REM
1210 REM          PRINT COPY
1220 REM
1230 GOSUB 1990: REM  PREAMBLE
1240 GOSUB 2180: REM  PURPOSE OF MEETING
1250 GOSUB 2290: REM  PERSONS PRESENT
1260 GOSUB 2240
1270 GOSUB 2350
1280 P=1:W=I:FOR I=1 TO W-1
1290 LPRINT A$(I)
1300 PRINT
1310 IF I=38 THEN GOSUB 1930
```

```
2000 LPRINT "                    THE BOARD OF DIRECTORS OF"
2010 LPRINT "                    EXECUTIVE COMPUTER, Inc."
2020 LPRINT "                    A California Corporation"
2030 FOR X=1TO3:LPRINT:NEXTX:RETURN
2040 X=1:PRINT:PRINT:PRINT "The following persons were present"
2050 LINE INPUT "- ";F$(X)
2060 IF F$(X)="*" THEN 340
2070 IF F$(X)="?" THEN 2100
2080 IF F$(X)="" THEN 2120
2090 X=X+1:GOTO 2050
2100 PRINT "Enter all names of participants of meeting. Give information"
2110 PRINT "asked for.":GOTO 2040
2120 LINE INPUT "Location of Meeting? ";LM$
2130 LINE INPUT "Date of Meeting? ";DM$
2140 LINE INPUT "Time of Day? ";TM$
2150 LINE INPUT "Purpose of Meeting? ";PM$
2160 LINE INPUT "Is this a < SPECIAL > meeting? ";XD$
2170 RETURN
2180 LPRINT "        The meeting of the Board of Directors of EXECUTIVE ";
2190 LPRINT "COMPUTER, Inc."
2200 LPRINT "a California Corporation, was held at : ";
2210 LPRINT TAB(30);LM$
2220 LPRINT"on ";DM$;", at ";TM$;"."
2230 RETURN
2240 LPRINT "The purpose of this meeting is as follows:":LPRINT
2250 P5=LEN(PM$)
2260 LPRINTTAB(20);PM$
2270 LPRINTTAB(20);:FOR X=1 TO P5:LPRINT"-";:NEXT X
2280 RETURN
2290 LPRINT:LPRINT "The following persons were present at this meeting:"
2300 LPRINT
2310 X=1
2320 LPRINT TAB(20);F$(X)
2330 IF F$(X)="" THEN RETURN
2340 X=X+1:GOTO 2320
2350 LPRINT:LPRINT:LPRINT
2360 LPRINT "SUMMARY OF DISCUSSION"
2370 LPRINT "====================="
2380 LPRINT:RETURN
2390 LPRINT:LPRINT
2400 LPRINT "        There being no further business, the meeting was";
2410 LPRINT " adjourned."
2420 LPRINT:LPRINT:LPRINTTAB(40);
2430 FOR XX=1 TO 30:LPRINT CHR$(95);:NEXT XX
2440 LPRINT
2450 LPRINTTAB(49);"Secretary"
2460 RETURN
2470 IF LEFT$(XD$,1)="N" THEN RETURN
2480 PRINT CHR$(27);CHR$(43)
2490 IF I>21 THEN PRINT "Insert new sheet of paper to include waiver -
        then HIT RETURN":PRINT CHR$(7):WAIT 0,1,1:GOSUB 2660
2500 LPRINT:LPRINT
2510 LPRINT "                         APPROVAL OF MINUTES AND"
2520 LPRINT "                      WAIVER OF NOTICE AND CONSENT"
2530 LPRINT:LPRINT
2540 LPRINTTAB(6);"        The undersigned, being all of the Directors of"
2550 LPRINTTAB(6);"the above corporation, do hereby give written consent"
2560 LPRINTTAB(6);"to the holding of the above special meeting of its Board"
2570 LPRINTTAB(6);"of Directors for all purposes and do hereby waive all notices"
2580 LPRINTTAB(6);"of said meeting required by the By-Laws of the said"
2590 LPRINTTAB(6);"corporation or as required by California Law and approve"
2600 LPRINTTAB(6);"the minutes of the business transacted as set forth above"
2610 LPRINT:LPRINT:LPRINTTAB(40);
2620 FOR XX=1TO30:LPRINT CHR$(95);:NEXT XX
2630 LPRINT
2640 LPRINTTAB(43);"Jon R. Lindsay, President"
2650 RETURN
2660 LPRINT TAB(57);"Page ";P+1: RETURN
```

A Business Application for the Summagraphics Bit Pad

By Marvin Mallon

As in many other business operations, the need to enter great amounts of data is prevalent in the operation of a garment factory. It is one of the few industries remaining that pays "piece work." That is, workers are paid by their volume of work rather than at a "flat" hourly rate. This requires not only a considerable number of calculations as to the correct "piece rate" for each new model, but also many more individual calculations at each payroll period. The microcomputer is a natural tool to bring assistance to overburdened clerks and harried shop supervisors. It only remains (as always) to properly program it to maximize the usefulness of this innovative appliance.

It was determined that a fast, accurate means for inputting this piece rate data to the computer (a PET had been decided upon principally because of its low cost and portability) was necessary. We obtained a Bit Pad ($555) and a power supply ($95) from the Summagraphic Corporation of Fairfield, Connecticut and began the project. The manual supplied with this unit was helpful, even more so was the technical assistance supplied by Summagraphic's engineering staff. Still, no one had (as best we could determine) attempted the PET interface before. It proved difficult because of the PET's unique memory-addressed bi-directional parallel port.

The Bit Pad was designed to "talk and listen" to a pair of conventional I/O ports. That's not the way that PET permits parallel interfacing.

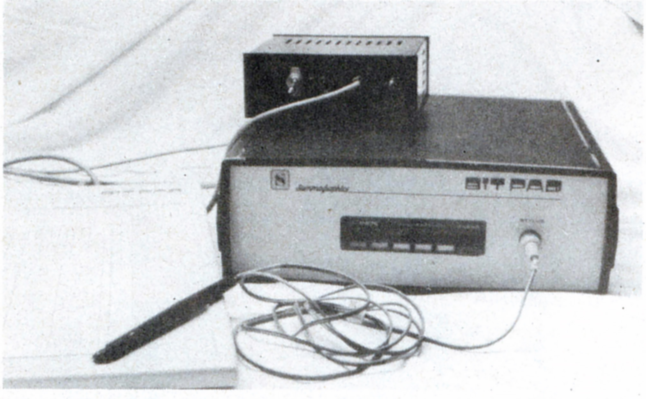


PHOTO 1 Bit Pad system consists of Control Unit, Power Supply, Tablet and Stylus. Instructions for interfacing to most microcomputers accompanies hardware.

Now follows a brief description of this unusual peripheral device. As seen in Photo 1, a Bit Pad system consists of four items. The most obvious is an 11 inch by 11 inch flat tablet that contains a pair of wire grids that lie embedded at right angles to each other. As taken from the Summagraphics manual, — "current is pulsed along a send wire that lies perpendicular to a mesh of magnetostrictive wires laid on a substrate beneath the tablet writing surface. This current pulse changes the dimensions of the magnetostrictive material and a strain wave propagates down all the wires in one direction simultaneously. The stylus and cursor have a 'receive coil' which senses the passing of the strain wave. The binary counter in the control unit is used to time the delay required for the strain wave to reach the receive coil. This binary count is then formatted by the microprocessor and outputted as X and Y coordinate data."

A second component of the Bit Pad system is the Control Unit. Its six pushbuttons program the mode of operation as well as the "sampling rate" of the stylus. One mode permits for complete remote software control making it possible to "bury" this attractive box and to command the Bit Pad directly from the computer.

The mode used for this application is identified as "point" and provides a single pair of coordinates each time the stylus is touched down on the tablet. The stylus contains a switch which triggers the data cycle and, in this mode, is reset for a new set of coordinates only after the stylus is lifted off the pad and placed down at a new location.

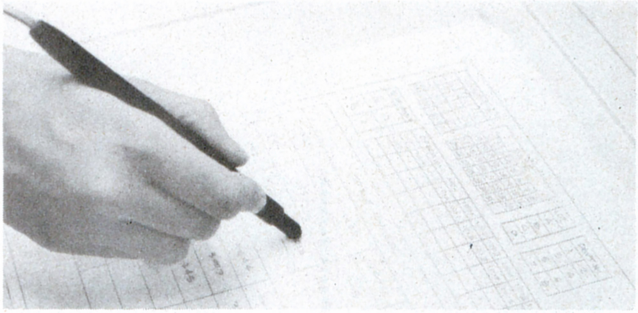


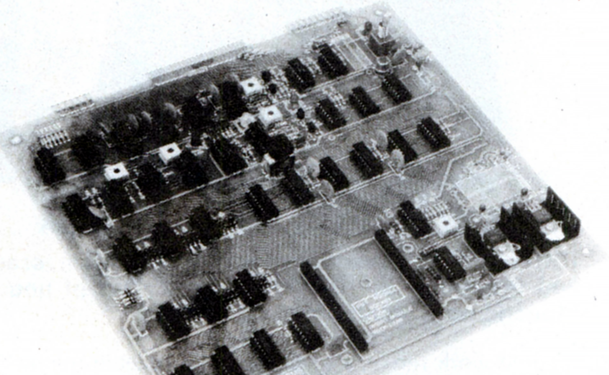
PHOTO 2 "Touching" the appropriate box on the "Menu" sheet sends X and Y coordinates to the computer. Program translates location and performs proper operation.

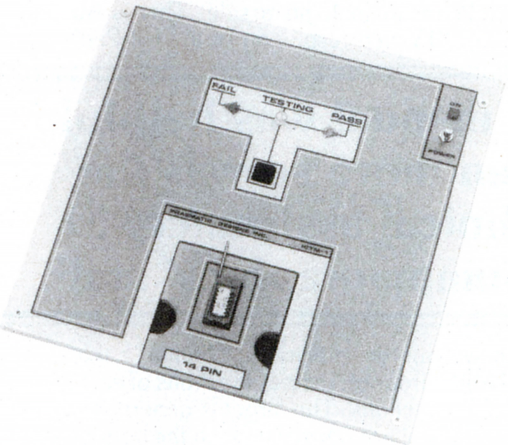
A third component is the auxiliary power supply. Inasmuch as the PET cannot supply the required voltages to drive the Summagraphics tablet and control unit, this accessory was a necessary investment. Unobtrusively, the supply interfaces easily with one supplied cable connection to the rear of the control unit as does the tablet. In a repackaged version of this total system it appears feasible to locate the power supply within the PET and parallel its 110 volt input with the computer's.

The last component of the Summagraphics system is the stylus. A single slender cable plugs into the Control Unit front panel. The stylus itself is an inexpensive ballpoint pen replacement cartridge cleverly rigged up to serve as the sensing device. The fact that it can leave an ink mark when used by the operator enhances its usefulness in our application. The check mark serves to identify those menu items that have been "ticked off."

Integrated Circuit Testing for Hobbyists

Tim Barry and Ed Ingber
Pragmatic Designs, Inc.
711 Stierlin Road, Mountain View, CA 94043





Hobbyists have used digital integrated circuits since the early seventies, when low cost TTL first became widely available. Since then the sophistication of both the ICs available and the projects in which these ICs are used have increased dramatically. As IC complexity has grown, it has become increasingly important to weed out defective ICs before they cause grief during circuit debugging or lead to intermittent circuit performance.

Until now, the major barriers to IC testing have been the cost of testers themselves and the complexity of developing test programs. However, recent advances in microcomputer technology have led to Pragmatic Designs' ICTM-1, a fully programmable, functional and parametric IC tester module which brings testing within the reach of all IC users.

WHY TEST ICs?

Most industrial users test incoming ICs on either a sample or 100% basis. Many pay a testing lab to do it for them. It all comes down to the economics of how many failures can be tolerated before testing the devices becomes cheaper than debugging boards. No manufacturer is perfect. IC manufacturers who have proven themselves to be high quality suppliers have incoming defective rates on the order of .5%. These devices usually only require spot checking to insure that the incoming ICs are of an acceptable quality level. Other manufacturers have typical incoming defective rates of from two to five percent. This often requires 100% screening.

Defective ICs not caught at incoming inspection reach the P.C. board, where testing and diagnosis is far more complex and expensive. In-house test capability also allows the user to burn-in ICs at high temperatures to accelerate premature failures. The weak devices fail during burn-in and are detected by the tester, preventing them from becoming costly field failures.

The hobbyist's motivation for testing ICs is largely the same as the industrial users: to save time and money. Hobbyists, until now, have had very limited capability for testing ICs, leaving them at the mercy of suppliers whose percent defective rates frequently far exceed those of industrial suppliers. The availability of a low cost tester simplifies the circuit debug process and ensures the reliability of ICs used. Junk box devices can be tested and reused while sources of low cost ICs, avoided because of unknown or dubious quality level, can now be used.

A further benefit of testing is that if ICs are known good, sockets need not be used. Sockets are both expensive and a proven source of system unreliability. Serious hobbyists can establish a simple burn-in/test procedure to further ensure long term system reliability.

IC TESTING

Digital IC testing is generally divided into two basic categories — functional and parametric. Functional tests compare the logical operation of the IC against a truth table or state diagram. A complete functional test of a two-input NAND gate, for example, consists of applying the four possible input logic combinations and comparing the logical output to the expected value, based on the truth table of a NAND gate. Parametric tests measure the analog characteristics of the IC, such as fan-in, fan-out, and supply current drain.

Functional testing finds many defects such as opens, some shorts, and mismarked ICs. Most "low cost" testers ($1,000 to $10,000) are functional testers only, which either compare the IC under test to a known good IC or which use manual switches to set up input patterns and indicators to show output states.

Functional testing alone cannot always ensure proper operation of the IC. An IC which logically performs according to its expected truth table may not always work in a circuit. A marginal output driver may not have sufficient capability to drive the required number of devices. Loading presented by a defective IC input may exceed the drive capability of a good IC preceding it. Low internal resistances can result in high supply current requirements which can in turn

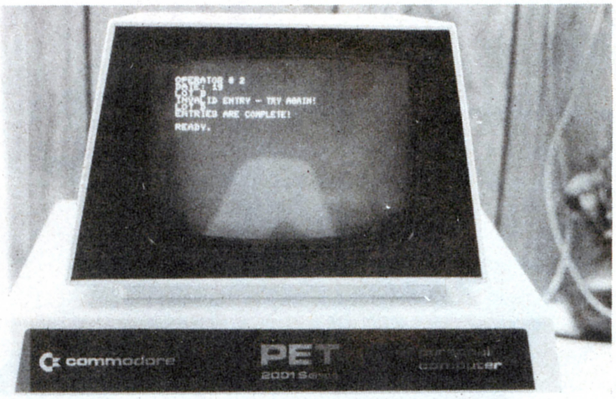
Photo 2 shows a hand-drafted "menu" sheet in place on the tablet. Its layout provides boxes for the entry of Operator Number, Date, Lot Number, etc. A final box in the lower right hand corner is labeled "Entries Complete" and is touched when all other entries have been input.

In operation, the procedure is as follows. The PET and the Bit Pad are powered up and the BASIC program is loaded in through the PET's integral cassette recorder. The program is run and after the conventional introducton messages on the screen, the user is prompted to enter data by touching the stylus to the appropriate boxes. The smallest square on the menu sheet is ¼ of an inch on a side. This is 50 times greater than the .005 inch resolution of the Bit Pad.

The manual was helpful, even more so was the technical assistance. . . by Summagraphics' staff.

The user need not be precise in "hitting" the target because the BASIC program defines the limits of each box in both the X and Y directions. The target is generous enough so that the operator will not normally touch the boundary line between adjacent boxes. A touchdown outside of the data square produces an "Invalid Entry" message on the screen and the user is prompted to "try again" (see Photo 3).

The last entry is from the "Entries Complete" box and signals the program that data entry is finished. The program then moves on to make computations based on the information inputted and produces the final reports.



```
OPERATOR # 2
DATE: 19
LOT: [illegible]
INVALID ENTRY - TRY AGAIN!
LOT: [illegible]
ENTRIES ARE COMPLETE!
READY.
```

PHOTO 3 PET's program produces relevant messages which confirm the Bit Pad signals. Out of bounds "touchdown" results in "Invalid Entry!"

Some work remains to be done. A reliable menu "hold-down" scheme will be developed, permitting fast re-registration of the printed sheets each time the procedure is run. This will not be difficult and we are presently investigating various "peg and hole" or "corner bar" techniques.

All in all the Summagraphics Bit Pad system has proven to be highly reliable and has capabilities beyond the crude use for which we are employing it in this application. Later projects will make use of it for the calculation of fabric area by tracing an outline of the clothing pattern and inputting the perimeter measurements directly to the PET.☐

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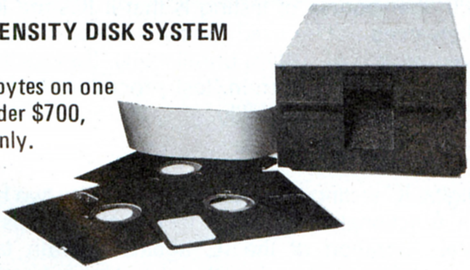

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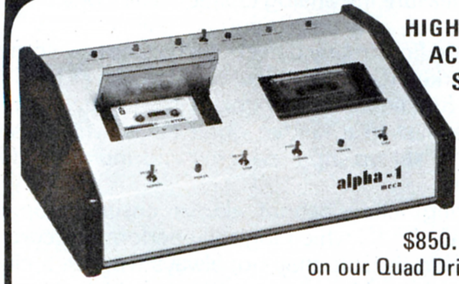

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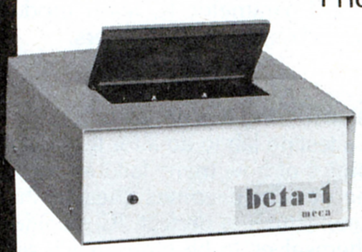

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cause the total supply current of the system to exceed the capability of the power supply. Parametric tests are designed to detect these types of failures.

WHAT IS ICTM-1?

The Integrated Circuit Tester Module is a computer peripheral which converts any microcomputer into a computer controlled, functional and parametric digital IC test system and laboratory.

Also available is TBASIC, a high level, BASIC like test language which allows a fast, straightforward test program generation and immediate executable statement capability. TBASIC is designed to run on any 8080, 8085, or Z-80 based microcomputer with CP/M operating system.

Assembly language drivers are provided for other popular microprocessors to permit assembly language level test programming on virtually any microcomputer.

By treating the tester functions as a peripheral to the computer, ICTM-1 represents a new approach to implementing a low cost IC test system. This approach allows the low cost microcomputer system hardware to be the "intelligence" of the test system while the peripheral provides the precision control and measurement electronics. It also allows users to multiply the value of their computer investment by getting extra service out of their existing computers.

ICTM-1 tests standard TTL, Low-Power Schottky TTL, Schottky TTL, LPTTL, HTTL, DTL, and 5 volt CMOS and NMOS. Its parametric test capability and the flexibility provided by its host computer also allow it to test small subsystems and some discrete and analog circuits. Test times for typical SSI and MSI digital ICs using TBASIC range from 50 ms to 500 ms.

ICTM-1 can also be used as the basis of a digital laboratory, driving an IC or interconnected ICs with stimuli specified at the computer keyboard using TBASIC. The tester module functions as a programmable power supply, 22 line TTL level function generator, and clock pulse generator in such an application. This allows the experimenter or student to observe and understand the operation of his circuits.

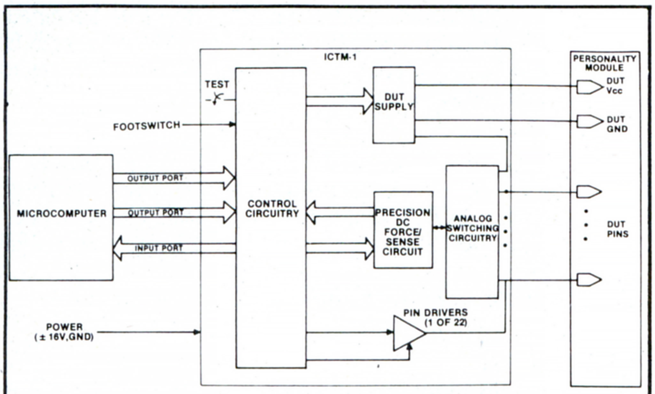

Figure 1. Test System Block Diagram.

HARDWARE DESCRIPTION

A block diagram of ICTM-1 is shown in Figure 1. The tester hardware consists of I/O interface control circuitry, programmable DUT (device under test) supply, pin drivers, a precision DC force/sense circuit, and analog switching circuitry.

The DUT supply can be programmed to 4.5, 4.75, 5.0, 5.25 and 5.5 volts. These are the nominal data sheet VCC specification values and allow worst case testing. Supply current to the DUT is measured by the DC sense circuit. Programmable pin drivers on each DUT pin force the inputs to their programmed logic levels. The DC force/sense circuit connects to DUT pins through the analog multiplexer switching circuitry. It is used to measure device input currents and to measure output voltages with programmed load currents. A summary of ICTM-1's specifications is shown in Table 1.

Table 1. ICTM-1 SPECIFICATION

Logic Family Compatibility
TTL. DTL. CMOS, NMOS, (any TTL compatible logic family)

Pin Electronics
22 low leakage TTL tristate drivers, programmable DC, force/sense circuit multiplexed to device pins

Current Force/Measure
Low Range — −510uA to +510ua (2uA steps)
Accuracy ± 10uA
High Range — −2mA to +20mA (.1mA steps)
Accuracy ± 100uA

Voltage Measure
Range 0 to 5.10V (20mV steps) Accuracy ± 10mV

Device Power Supply
Vcc programmable to 0V, 4.5V, 4.75V, 5.0V, 5.25V, 5.5V Accuracy ± 50mV
Icc device supply current maximum = 250mA

Power Supply Requirements
+ 16V DC @ 500mA
− 16V DC @ 50mA

Dimensions
11.0W × 10.25L. Sloped aluminum cabinet, maximum height = 2"

Options
AC power supply
Footswitch
Personality modules
14, 16, 18, 20, 22, 24 pin (zero insertion force socket)
Universal (user defined function)
S-100 interface (IF-1)
High level control language (TBASIC)

HARDWARE INTERFACE

The tester module interfaces to the host computer via a simple I/O port interface. This makes the peripheral bus independent and usable with any computer. The interface requires two latched output ports and one unlatched input port. No strobes or handshaking are required. An S-100 interface board, IF-1, is available to connect the tester module directly to S-100 computers. Power for the tester module (unregulated ±16 volts) can also be obtained from the S-100 bus through the IF-1 interface board, or can be furnished by an external power supply.

ICs are tested in zero-insertion force sockets mounted on standard personality modules, available for 14, 16, 18, 20, 22, and 24 pin devices. A universal personality module for building custom test fixtures or special user defined functions is also offered.

The standard personality modules assign DUT power to corner pins (i.e. pin 8=GND, pin 16=VCC for 16-pin devices). The rare non-corner power pin ICs may be accommodated on the universal personality module. No jumpers or components are required on the personality module to customize it to test most ICs. This is because each tester pin is programmable as an input or output and because output pin loading is provided by the DC force/sense circuit. This means that, unlike many other testers, one 16-pin personality module, for example, will test most 16-pin corner power pin digital ICs. This results in a significant savings to the user who tests many different device types.

SOFTWARE DESCRIPTION

Assembly language drivers are provided for users, allowing the tester to be used with virtually any microcomputer.

Users with more elaborate systems can control ICTM-1 using TBASIC (Tester Extended BASIC), a floating point BASIC interpreter designed to provide a fast and convenient method for developing IC test programs.

Using TBASIC, the programmer defines test limits, specifies pin lists, controls indicator outputs, and performs any desired calculations on accumulated data. Since the test language is an extension of BASIC, the programmer can sort parts, perform statistical summaries, and devise elaborate failure analysis outputs for the devices tested. TBASIC is designed to run with the CP/M disk operating system.

TESTER COMMANDS

The TBASIC commands and functions are listed in Table 2. The tester extensions are described briefly below, with an example provided for each instruction. Terms in braces ({ }) are optional and usually have default values.

Table 2. TBASIC Language Summary

COMMANDS
- RUN
- USE
- SAVE
- LIST
- LLIST
- SCR
- BYE

STATEMENTS
- LET
- FOR-NEXT
- IF-THEN
- GOTO
- GOSUB-RETURN
- PRINT
- LPRINT
- DIM
- REM
- CLEAR
- POKE
- DPOKE
- OUT
- READ
- RESTORE
- DATA
- CLEAR

FUNCTIONS
- +, −, *, /
- ABS
- SQR
- INT
- SGN
- PEEK
- DPEEK
- IN
- CALL
- PMAP
- DMAP

TESTER CONTROL STATEMENTS
- SET DEV
  - FAIL
  - PASS
  - INPIN
  - OUTPIN
  - TSPIN
  - CLOCK
  - RESET
- TEST
- RESET
- CLOCK
- FORCE VCC
  - HIGH
  - LOW
- MEASURE IIN
  - ISUP
  - HIGH
  - LOW
  - TSTATE
  - DCARE
- EOT PASS
  - FAIL
  - HOLD

SET DEV = <# of Pins>
  # of Pins=14,16,18,20,22,24
  Defines the total number of pins on the device being tested.
  Example — SET DEV=14

SET FAIL = <Fail line>{#<Fail count>}
  After the number of failures equal to "fail count" have occurred on a device, program execution transfers to the specified "fail line." "Fail count" defaults to 1 if not specified.
  Example — SET FAIL=100#3
  Transfer to line 100 on third fail.

SET PASS = <Pass line>{#<Pass count>}
  After the number of passes equal to "pass count" have occurred on a device, program execution transfers to the specified "pass line." "Pass count" defaults to infinite (disabled).
  Example — SET PASS=100#1
  Transfer to line 100 on first pass.

SET INPIN = <Pin list>{#<Parametric limits>}
  Defines the device under test input pins and parameters for input current test. Parameters include VIL, VIH, IIL, and IIH, and are specified in volts and milliamperes. They may be constants, BASIC variables or expressions. Multiple statements are allowed for pin lists with different parameters. Default values are VIL and VIH=0 (not tested); IIL and IIH=0 (not tested).
  Example — SET INPIN=1,2,4,5#VIH=,VIL=*.8,*
  IHH=.04,IIL=−1.6

SET OUTPIN = <Pinlist>{#<Parametric limits>}
  Defines the device under test output pins and parameters. Parameters include VOL, VOH, IOL, and IOH, and default to functional test only. Default values are VOL=.4,VOH=2.4,IOL and IOH=0 (not tested).
  Example — SET OUTPIN=3,6,11,8#VOH=2.4,
  VOL=.4,IOH=−.4,IOL=16

SET TSPIN = <Pinlist>{#<Parametric limits>}
  Defines the device under test tristate output pins and high impedance state parameters. Parameters include VOZL, VOZH, IOZL, and IOZH. Default values are IOZL=−.1mA,IOZH=.1mA,VOZH=.4V,VOZH=2.4V.
  Example — SET TSPIN=3,5,7,13,11,9#IOZH=.04,
  VOZH=2.4,IOZL=−.04,VOZL=.4

SET CLOCK = <Pinlist>{#<Clock Polarity>}
  Defines the device under test input pins which are to be considered device clock inputs. The clock polarity (POS or NEG) defines the polarity of the pulses applied to the device clock pins. The default polarity is positive.
  Example — SET CLOCK=8#NEG

SET RESET = <Pinlist>{#<Reset Polarity>}
  Defines the device under test input pins considered device reset inputs.
  Example — SET RESET=9#NEG

FORCE VCC = <VCC value>
  Forces the device under test VCC to value specified. VCC value can equal 0, 4.5, 4.75, 5.0, 5.25, or 5.5, or a BASIC variable or expression which evaluates to one of the legal values.
  Example — FORCE VCC=5.25

FORCE{<Level> = <Pinlist>#<Level> = <Pinlist>}
  Forces the device pins in pinlists to levels specified (HIGH or LOW). Only pins whose state changes need be specified after all pins are forced into their initial states.
  Example — FORCE LOW=3,6,11,8#HIGH=
  2,5,12,9

MEASURE IIN
  Measures input current of all the DUT pins defined as inputs using parameters defined in SET INPIN statements. Program execution continues with the next line unless the number of test fails or passes defined in SET FAIL or SET PASS statement has been reached, in which case program control jumps to the line number specified.
  Example — MEASURE IIN

MEASURE ISUP = Current limit
  Explicit measurement of DUT supply current. "Current limit" is a constant BASIC variable, or expression which evaluates to 0-255 (mA). If measured value exceeds "current limit," a fail occurs.
  Example — MEASURE ISUP=8

MEASURE{<Level> = <Pinlist>#<Level> = <Pinlist>. . .}
  Measures logic level of all output pins (HIGH, LOW, TSTATE, or DCARE (Don't care)) using parameters defined in the SET OUTPIN and SET TSPIN state-

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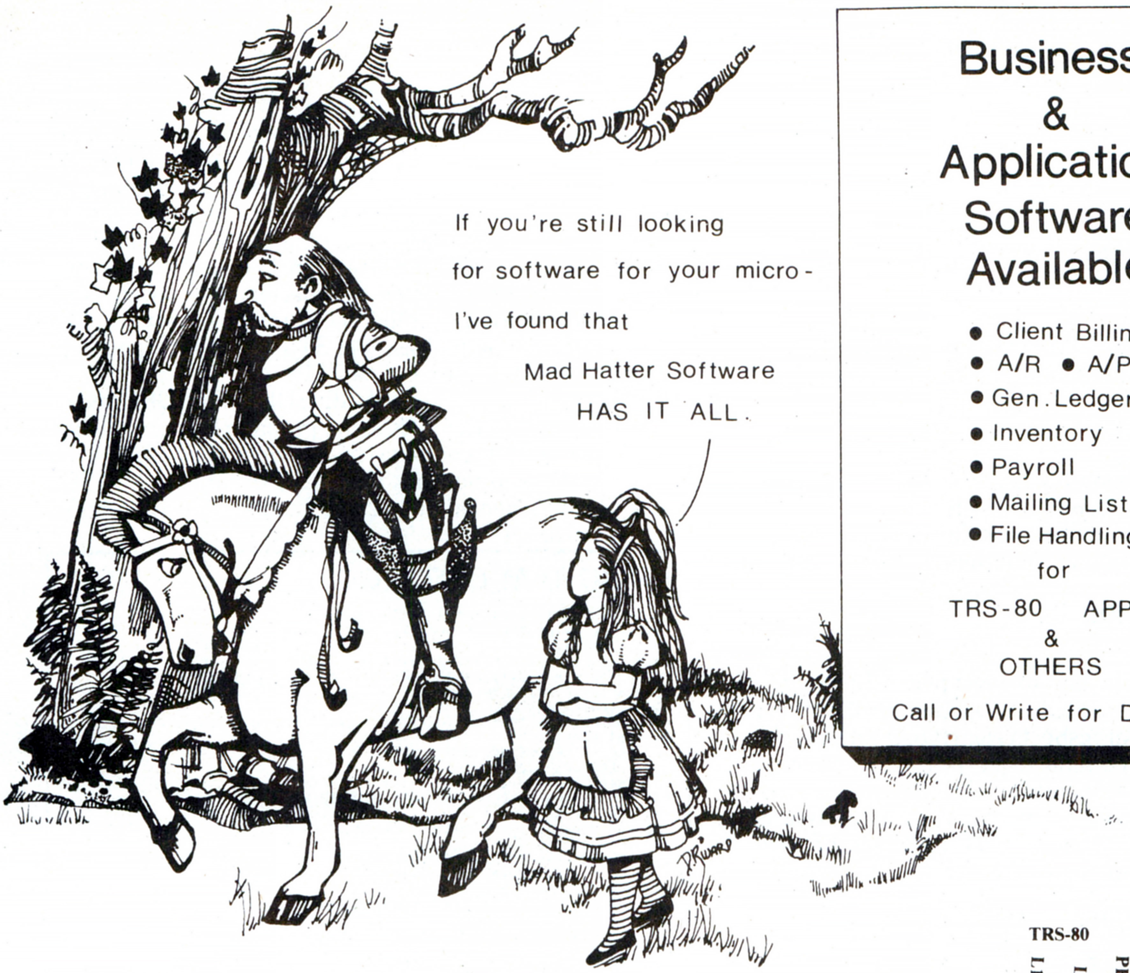

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ments. The logical state of output pins not listed are assumed not to have changed since previous MEASURE statement, and are tested for the previously specified state.

Example — MEASURE HIGH=3,5,7#TSTATE=
13,11,9

RESET

Pulses all pins defined as reset pins in the previous SET RESET statement.

Example — RESET

CLOCK = <Count>

Pulses all pins defined as clock pins by the previous SET CLOCK statement "count" times. "Count" defaults to 1.

Example — CLOCK=4

TEST{,<Line number>}

Waits for the test button to be depressed. When pressed, program execution continues with the next line. If CNTL-Z is entered on the console while waiting for test button, the program transfers to line number specified.

Example — TEST,400

EOT {End code}

Resets the tester at the end of a test plan. "End code" can be PASS, FAIL, or HOLD. PASS or FAIL light the green or red indicator respectively. HOLD causes control to pass to the command level of the interpreter, with the hardware suspended, allowing execution of immediate executable statements. If no end code is specified, an EOT PASS or EOT FAIL will be executed depending upon whether or not any failures have occurred.

Example — EOT PASS

SOFTWARE INTERFACE

TBASIC is supplied on a single density full size or minifloppy disk in CP/M compatible format.

Source listings of assembly language drivers for the 8080, 8085, Z-80, 6502, and M6800 computers are provided in the User's Manual.

SAMPLE PROGRAM

Now that we have an overview of the ICTM-1 hardware and TBASIC programming language, we can write a typical TBASIC test program for testing a quad 2-input NAND gate. Program 1 shows the test program listing. Its 29 executable lines test the device and accumulate a running count of good and bad devices. The program count be easily modified to test any quad 2-input gate package.

Line 30 defines the mapping of the tester pins to the 14 device pins. Lines 40 and 50 define the input pins, DC parameters for input current tests, output pins, and output pin DC loading parameters. Multiple SET INPIN and SET OUTPIN statements are permitted for devices with different DC parameters on different pins.

The program branch location on failed test is defined in line 70. SET FAIL statements may be located anywhere in the program — the most recently specified fail line number is the program branch location on the n'th fail (n defaults to first fail).

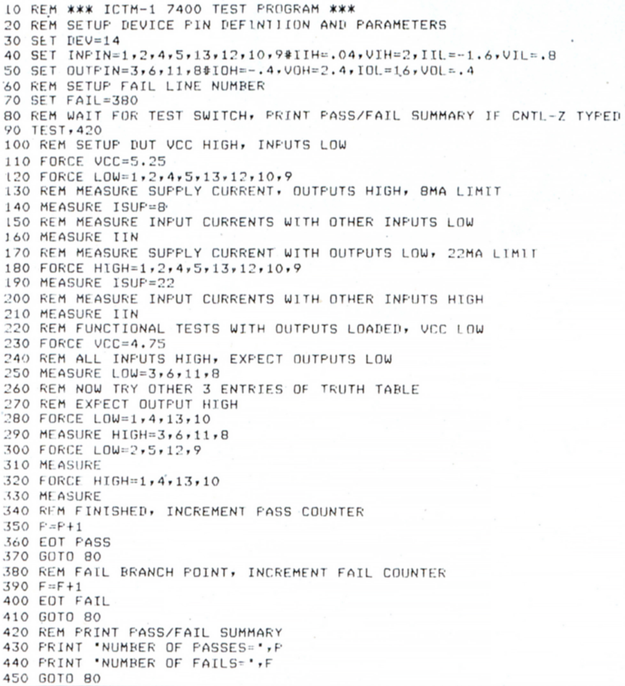
The program execution holds at line 90 until the TEST switch is pressed, in which case execution continues with the next statement. If CNTL-Z is typed on the keyboard while waiting for the test button the program branches to location 420 and prints a PASS/FAIL summary on the computer's output device.

Line 110 sets the DUT supply to the maximum guaranteed operating voltage of the 7400, and allows a worst case test of supply current and input currents. Supply current is measured with the outputs set up for high (line 140) and low (line 190) with limits obtained from the 7400 data sheet. Input currents are measured, with other inputs forced low (line 160) and high (line 210) for worst case testing.

In line 230 the supply voltage is reduced to 4.75 volts (the minimum guaranteed operating voltage) for the functional tests. All inputs are still high so the outputs for all four NAND gates are expected low. Line 250 tests all outputs for the expected logic low levels. During these tests the outputs are loaded with 16mA and tested for a voltage less than .4 volts (limits defined in line 50). The other three entries of the NAND gate truth table are tested in lines 290, 310, and 330. Only pins whose forced or expected state has changed since the last FORCE or MEASURE statement are required to be entered in the pinlists; line 310 and 330 expect outputs high as last defined in line 290.

If a fail occurs in any MEASURE ISUP, MEASURE IIN, or MEASURE HIGH/LOW tests, the program branches to line 380. A device FAIL counter is then incremented and the red "FAIL" LED is turned on. If no fails occur, the "PASS" counter is incremented in line 350, and the green "PASS" LED is turned on.

PROGRAM LISTING



```
10 REM *** ICTM-1 7400 TEST PROGRAM ***
20 REM SETUP DEVICE PIN DEFINTIION AND PARAMETERS
30 SET DEV=14
40 SET INPIN=1,2,4,5,13,12,10,9#IIH=.04,VIH=2,IIL=-1.6,VIL=.8
50 SET OUTPIN=3,6,11,8#IOH=-.4.VOH=2.4,IOL=16,VOL=.4
60 REM SETUP FAIL LINE NUMBER
70 SET FAIL=380
80 REM WAIT FOR TEST SWITCH, PRINT PASS/FAIL SUMMARY IF CNTL-Z TYPED
90 TEST,420
100 REM SETUP DUT VCC HIGH, INPUTS LOW
110 FORCE VCC=5.25
120 FORCE LOW=1,2,4,5,13,12,10,9
130 REM MEASURE SUPPLY CURRENT, OUTPUTS HIGH, 8MA LIMIT
140 MEASURE ISUP=8
150 REM MEASURE INPUT CURRENTS WITH OTHER INPUTS LOW
160 MEASURE IIN
170 REM MEASURE SUPPLY CURRENT WITH OUTPUTS LOW, 22MA LIMIT
180 FORCE HIGH=1,2,4,5,13,12,10,9
190 MEASURE ISUP=22
200 REM MEASURE INPUT CURRENTS WITH OTHER INPUTS HIGH
210 MEASURE IIN
220 REM FUNCTIONAL TESTS WITH OUTPUTS LOADED, VCC LOW
230 FORCE VCC=4.75
240 REM ALL INPUTS HIGH, EXPECT OUTPUTS LOW
250 MEASURE LOW=3,6,11,8
260 REM NOW TRY OTHER 3 ENTRIES OF TRUTH TABLE
270 REM EXPECT OUTPUT HIGH
280 FORCE LOW=1,4,13,10
290 MEASURE HIGH=3,6,11,8
300 FORCE LOW=2,5,12,9
310 MEASURE
320 FORCE HIGH=1,4,13,10
330 MEASURE
340 REM FINISHED, INCREMENT PASS COUNTER
350 P=P+1
360 EOT PASS
370 GOTO 80
380 REM FAIL BRANCH POINT, INCREMENT FAIL COUNTER
390 F=F+1
400 EOT FAIL
410 GOTO 80
420 REM PRINT PASS/FAIL SUMMARY
430 PRINT 'NUMBER OF PASSES=',P
440 PRINT 'NUMBER OF FAILS=',F
450 GOTO 80
```

OTHER APPLICATIONS

ICTM-1 can be used to test devices other than digital ICs. It is fully programmable, capable of performing parametric tests, and using the universal personality module allows the tester to force and sense up to 22 device pins. This makes it possible to test diodes, transistors, LEDs, resistor packs, relays, optical isolators, small P.C. boards and other devices. Additional hardware can also be added to the universal personality module to allow users to test relatively complex analog/digital subsystems.

SUMMARY

Comparing ICTM-1 with existing IC test equipment is difficult, because it represents a new approach to implementing an IC test system. For industrial users its parametric test capability and high level programming language provide a fundamental capability comparable to IC testers selling for tens of thousands of dollars.

For hobbyists, however, ICTM-1 offers benefits beyond the practical considerations of saving time and money. It makes their existing computers more useful and provides an opportunity for learning about ICs, computer control, and test program development.☐

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FOR THE ALPHA MICRO SYSTEM

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CIRCLE INQUIRY NO. 58

Pep Talk for Non-Technical Micro-Bugs

By Karen S. Wolfe

There it was, in bits and pieces all over the living room floor. If I could fit all the pieces together and hold them in place with nuts, bolts and solder, I would have a microcomputer. Admittedly, as I sat in the midst of that confusion, I had misgivings. What was worse, my lack of faith in myself was well founded.

My mechanical experience consisted of changing the air filter in my car and adding water to the radiator. Occasionally, I emptied the ashtray (even though I don't smoke). My computer hardware knowledge was almost non-existent, but I could program in BASIC and had worked with a minicomputer system. Now, where I got the idea that my programming knowledge gave me the right to attempt constructing my own personal computer, I'll never understand. But the fact is, we do live in a country where we can make fools of ourselves if we're persistent about it.

Let me give you the bottom line; not only did I put the system together but it actually worked. It worked so well, in fact, that I now use it for business purposes.

If you are considering building a system of your own but have little or no technical knowledge, you may find my experience helpful. This is not a technical expose of how to assemble a system. The following section presents a "feel" for the challenge you may find yourself facing. The last section concerns itself with the system, tools, testing equipment and patience.

EXCUSE ME, BUT WHERE'S THE BOOTSTRAP?

There I was, a 30-year-old woman with no previous soldering experience, telling the computer store operator that I wanted to assemble my own system, including the individual circuit boards (the most difficult soldering task). To his credit he didn't try to dissuade me, although I could tell he had doubts about my project.

I was working with Bits and Bytes Computer Store in Phoenix, and at the time they had not been open very long; but their experience with a couple of people who had tried soldering boards had not been good. Still, others had done well. The owners suggested I start with a relatively simple PROM/RAM board. If I ruined that card beyond repair, at least my education wouldn't cost too much.

They were certainly surprised when I trotted back to the shop with my clean, neat, short-free assembled board. My confidence was riding high and their confidence in me was established. But I blew the whole effect when I asked, "What's an edge connector and where's the bootstrap?" Their patience, encouragement and their ability to answer assembly questions over the telephone all helped to produce a finished product.

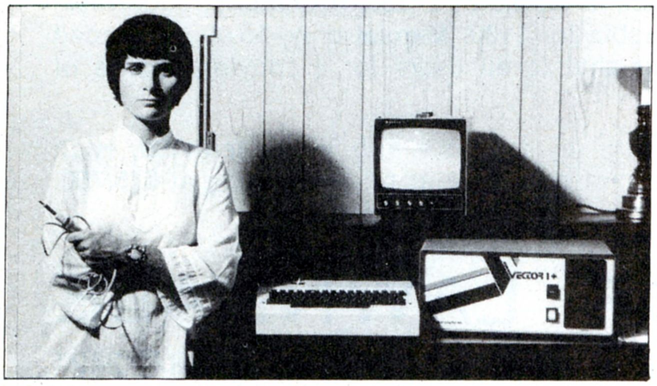

PHOTO 1 For the non-technical, the world of microcomputers can be mysterious and forbidding—but not unconquerable. Author and pet Vector microsystem.

What does my system consist of? It can be listed as follows: Vector 1 + power source and mainframe, S-100 bus, North Star disk system, Act I terminal, Sanyo 9" monitor, Z-80 CPU and a 132 column Centronics teleprinter. It is a 24K RAM working computer that offers my 5-year-old son unlimited educational opportunities and offers business applications for myself.

That gives you an idea of my experience, but where do YOU start? You start by investigating, reading computer magazines like you are now, and learning some of the vocabulary. Then you do it.

GOING FOR IT

First, decide why you want a microcomputer: for business, for practical home projects (budgets, taxes) or just for having fun. Then decide how much money you are willing to spend on a system. After some investigation you may find the "why" and the "how much" are not compatible. That's a problem you'll have to conquer on your own.

Next, transport yourself to a microcomputer store (or, at least, a computer exhibition). You should see complete systems in operation, learn their capabilities and limitations, what peripheral units are available and with whose equipment they will function. If you are going to mix manufacturers as I did, pick a system that has already been assembled, debugged and is functioning in a computer store.

Remember, if you're going to assemble all or part of the system yourself, you are doing so in order to save a little money, have some fun, learn a little about what goes into a microcomputer, and have the satisfaction of knowing that you have accomplished a difficult feat.

If you don't care "why" the system works, only that it does, save yourself sleepless nights and ulcers. Either buy one manufacturer's total system or duplicate the computer store's mixed system. This way the technical experts will have already made certain the various manufacturers' equipment is compatible. If the circuit on an input/output board needs alterations, a jumper for example, the store operators can show you where and how to make the modifications.

Here's another hint. Try to choose a store whose personnel are technically knowledgeable. Remember you are not a technician, and chances are you will need technical advice somewhere along the way. Be sure you can get the technical help when needed. And never be afraid or apologetic about asking a "dumb" question. If you're putting a couple thousand dollars into a system, there ARE no dumb questions.

When buying a kit to assemble (either a mainframe, power supply or board), check out the assembly instructions first. As with all things, some manufacturers do a better job of explaining procedures while others can be rather vague. Be sure you know where the instruction booklet is taking you before you leave the store.

Helpful hint: don't rush! It took me two months to get an operational system, but it *worked* the first time the power was turned on. Most of my time was spent soldering the boards; certainly this is no place for the terminally impatient. Maybe I was slow, but I had never before soldered anything in my life; and first, I practiced. You should, too.

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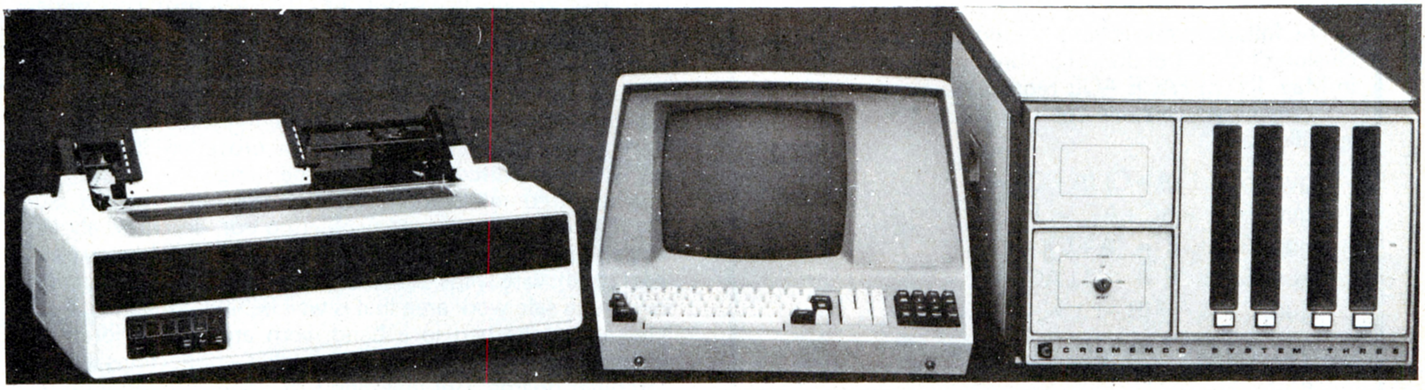

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CORRECTIONS

NTS UNIT 3

The following corrections should be made for the conclusion of Unit 3 of the NTS Mini Series which appeared in May. INTERFACE AGE regrets the errors.

Corrections versions of equations in the figures specified are:

Figure 56a: $(A+C)\ (A+C) = E$
Figure 56b: $AC+AC = E$
Figure 57a: $E = (A+C)(A+C)$
Figure 57b: $E = AC+AC$
Figure 71: $A+(B+C) = (A+C)+B = B+(A+C)$
Figure 78: $A \bullet A = 0$
Figure 79: $A+A = 1$
Figure 84, last symbol: $AB = S$

The following corrections should be made in the text of the article.

Page 116, **Minimizing Complex Expressions**
The first sentence should end $(A+AD)(AC+B)=S$

Page 116, **Another Example**
The equation demonstrating equivalence between two expressions should read $(A+C)(A+C) = AC+AC$

Page 117, **De Morgan's Theorems**
The equation preceding the Operational Rules section should read $B = A+C = AC$.

Page 117, **Theorem 15.**
The final equation should read $A+BC = AB+AC$.

PAYDAY PROBLEMS

Dear Editor:

"PAYDAY," published in the May, 1979 issue of INTERFACE AGE incorporated two layout problems which may not have been easy to spot. The program INIT was not identified but was printed following line 520 of Program 13. The program INI1 was not included. The short listing follows:

INIT will CHAIN the INI1, CHCF and MAIN programs. Then the user is ready to call option 9, Built F. I. T. W/H tables and the option 1, Add Employees.

If any readers wish to contact the authors of "PAYDAY" for any alterations that may have become necessary, please feel free to write to me personally at 4347 East Grove Street, Phoenix, AZ 85040.

Jim Schreier

```
0001 REM INI1.BAS WRITTEN 1/78 BY DAVE GARDNER
0002 REM PERSONAL COMPUTER PLACE, MESA, AZ
0005 STRING=128
0009 PRINT
0010 PRINT "THIS PROGRAM CREATES THE PAYROLL CONTROL FILE"
0020 PRINT "IT SHOULD ONLY BE RUN ONCE TO CREATE THAT FILE."
0030 PRINT
0040 PRINT "DO YOU STILL WISH TO DO IT";:INPUT A$
0045 IF LEFT$(A$,1)<>"Y" THEN 200
0050 PRINT "DO YOU KNOW WHAT YOU ARE DOING";:INPUT A$
0080 IF LEFT$(A$,1)<>"Y" THEN 200
0090 CREATE "PAYCTL" REC=100,FILE=1
0100 PRINT "I WILL NOW GET READY TO LET YOU EDIT THE NEW CONTROL"
0110 PRINT "FILE. YOU MUST ENTER FICA RATE, FICA LIMIT, ETC."
0120 PRINT "IN ORDER FOR THE PAYROLL SYSTEM TO WORK PROPERLY."
0130 CHAIN CHCF
0140 END
0200 PRINT "GOING BACK TO MAIN":CHAIN MAIN
```

Take a few pieces of wire, strip off the insulation at the ends, then practice soldering the pieces together. You are trying to gain the "feel" and "timing" it takes to complete a clean, controlled solder connection. It's probably a good idea before investing in computer equipment kits to invest a very small amount in a spool of #20 gauge, rosin core solder (at least 60% tin and 40% lead) and a small 30 watt (or less) soldering iron with a chisel shaped tip and give soldering a try.

Many people will take to soldering easily, others will not. It is better to buy the inexpensive soldering tools first and discover you're not comfortable with the procedure than to ruin a $100 board discovering the same thing.

When it comes to tools, there's really not much to say. You'll need the inexpensive soldering iron described above, wire strippers (or a surgical dissecting knife from botany class like I used), wire snips, screw driver, sponge for the soldering iron and a safe work area that is well lighted. I tried a magnifying glass attached to a band worn around the forehead when soldering the small chip socket connections in the computer boards. But that didn't last long; I found it got in the way. Your experience may be different.

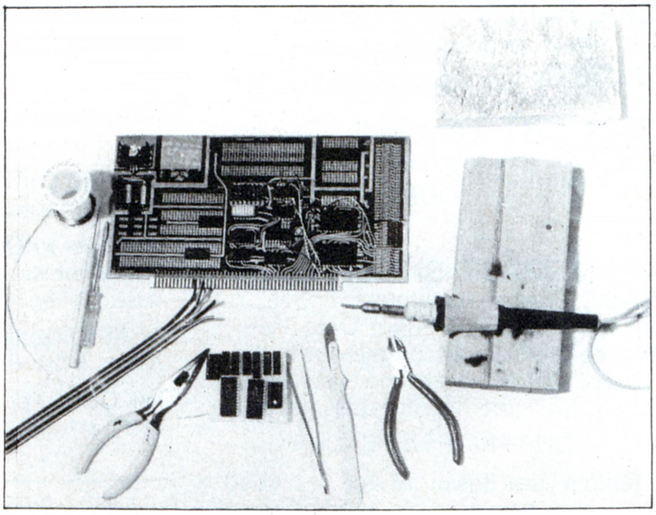


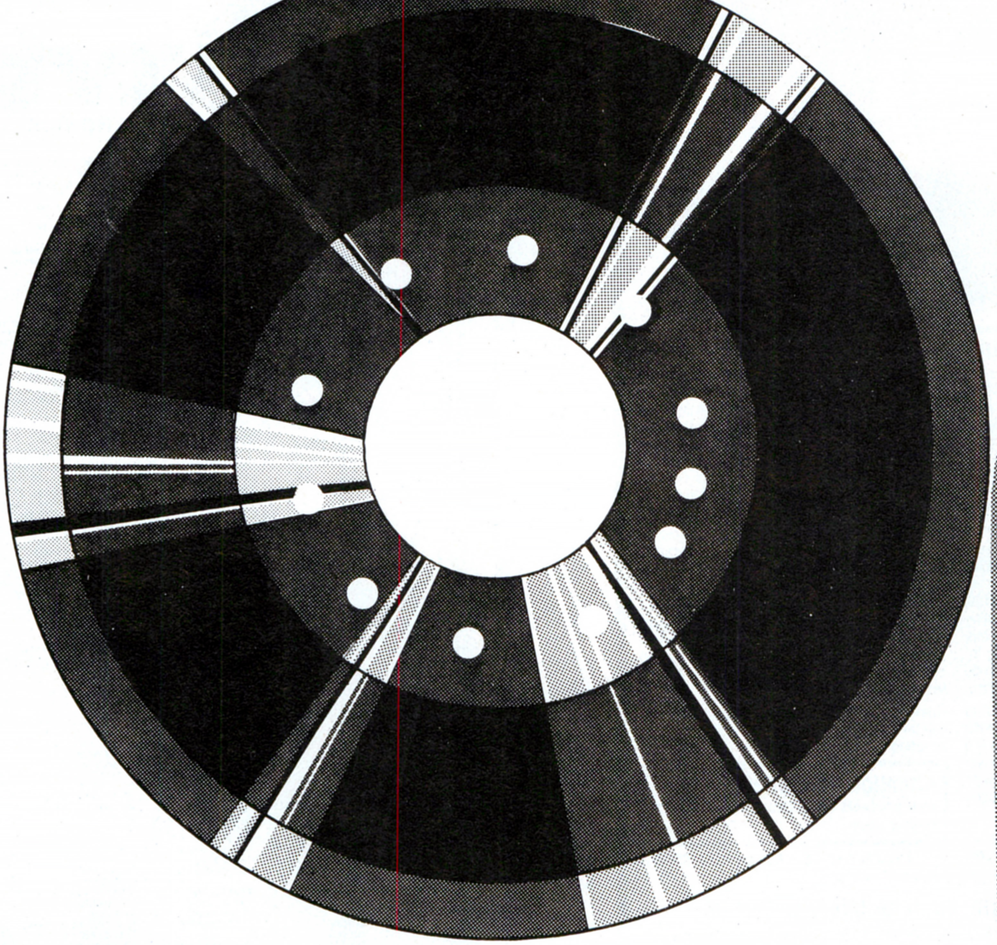
PHOTO 2 Assortment of tools that come in handy, including two types of wire cutters and a block of wood upon which to rest a hot soldering iron.

You may wonder about the necessity of having voltage meters, oscilloscopes, etc. I did not have such electronic testing equipment. I took each board back to the computer shop after completion and had them check the circuits, chips and voltage regulators. The computer shop did not charge for the testing. There was a problem with one board; they did the troubleshooting and corrected the problem for a very reasonable fee. Similar procedures are probably followed at other stores.

The computer store comes in handy for another purpose. When power is switched on, electricity flows through the system and that's about all. That collection of wires, chips and transistors doesn't know it's a computer. "Bootstrapping" is a way of loading a larger program into the system that lets it know it is a computer. I don't understand bootstrapping; I don't really have to.

The technicians at Bits and Bytes provided two programmable read only memory chips (PROMs) for me, which, as soon as power is switched on, allow monitor/terminal communication with the rest of the system. By typing an initial code into the terminal, I can awaken the sleeping intelligence contained in that plain, metal box that sits on my desk.

Now, you may decide to purchase a system already assembled and all you have to do is plug it in. That's fine; it will get you off and running in the more important world of using the computer. But I must admit, my experience assembling my pet Vector is one I wouldn't trade.☐



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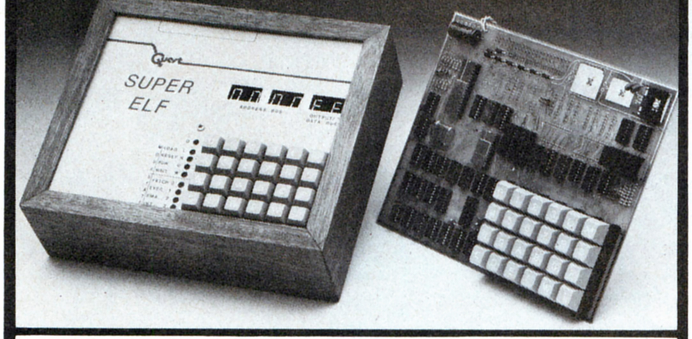

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An RCA 1861 **video graphics** chip allows you to connect to your own TV with an inexpensive video modulator to do graphics and games. There is a **speaker system** included for writing your own music or using many music programs already written. The speaker amplifier may also be used to drive relays for control purposes.

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Remember, other computers only offer Super Elf features at additional cost or not at all. **Compare before you buy. Super Elf Kit $106.95, High address option $8.95, Low address option $9.95. Custom Cabinet** with drilled and labelled plexiglass front panel **$24.95.** Expansion Cabinet with room for 4 S-100 boards **$41.00. NiCad Battery Memory Saver Kit $6.95.** All kits and options also come completely assembled and tested.

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Tiny Basic cassette $10.00, on ROM $38.00, original Elf kit board $14.95.

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This is truly an astounding value! This board has been designed to allow **you** to decide how you want it optioned. **The Super Expansion Board comes with 4K of low power RAM** fully addressable anywhere in 64K with built-in memory protect and a **cassette interface**. Provisions have been made for all other options on the same board and it fits neatly into the hardwood cabinet alongside the **Super Elf**. The board includes slots for up to 6K of **EPROM** (2708, 2758, 2716 or TI 2716) and is **fully socketed**. EPROM can be used for the monitor and Tiny Basic or other purposes.

A 1K Super ROM Monitor $19.95 is available as an on board option in 2708 EPROM which has been preprogrammed with a program loader/editor and error checking multi file cassette read/write software, (relocatible cassette file) another exclusive from Quest. It includes register save and readout, block move capability and video graphics driver with blinking cursor. Break points can be used with the register save feature to isolate program bugs quickly, then follow with single step. The Super Monitor is written with subroutines allowing users to take advantage of monitor functions simply by calling them up. Improvements and revisions are easily done with the monitor. If you have the **Super Expansion Board** and **Super Monitor** the monitor is up and running at the push of a button.

Other on board options include **Parallel Input and Output Ports** with **full handshake**. They allow easy connection of an ASCII keyboard to the input port. **RS 232 and 20 ma Current Loop** for teletype or other device are on board and if you need more memory there are two **S-100** slots for static RAM or video boards. A Godbout 8K RAM board is available for $135.00. Also a 1K Super Monitor version 2 with video driver for full capability display with Tiny Basic and a video interface board. **Parallel I/O Ports $9.85, RS 232 $4.50, TTY 20 ma I/F $1.95, S-100 $4.50. A 50 pin connector set** with ribbon cable is available at $12.50 for easy connection between the **Super Elf** and the **Super Expansion Board.**

The **Power Supply Kit** for the Super Expansion Board is a 5 amp supply with multiple positive and negative voltages $29.95. Add $4.00 for shipping. Prepunched frame $7.50. Case $10.00. Add $1.50 for shipping.

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7410N	.17
7414N	.63
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7422N	1.39
7430N	.20
7442N	.50
7445N	.69
7447N	.60
7448N	.69
7450N	.17
7474N	.29
7475N	.49
7485N	.88
7489N	2.00
7490N	.43
7492N	.43
7493N	.43
7495N	.69
74100N	.90
74107N	.29
74121N	.34
74123N	.59
74125N	.39
74145N	.69
74150N	.95
74151N	.69
74154N	1.00
74157N	.69
74161N	.87
74162N	.87
74163N	.87
74174N	.96
74175N	.90
74190N	1.15
74192N	.87
74193N	.85
74221N	1.55
74298N	1.65
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74367N	.95

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74LS02N	.25
74LS04N	.25
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74LS08N	.25
74LS10N	.25
74LS13N	.40
74LS14N	.90
74LS20N	.25
74LS22N	.25
74LS28N	.41
74LS30N	.25
74LS33N	.39
74LS38N	.30
74LS74N	1.15
74LS75N	.47
74LS90N	.51
74LS93N	.51
74LS95N	1.89
74LS107N	.35
74LS112N	.35
74LS113N	.35
74LS132N	.72
74LS136N	.35
74LS151N	.67
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CD4012	.28
CD4013	.36
CD4014	.86
CD4015	.86
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CD4017	.94
CD4018	.94
CD4019	.28
CD4020	1.02
CD4021	1.02
CD4022	.86
CD4023	.28
CD4024	.75
CD4025	.28
CD4026	1.51
CD4027	.36
CD4028	.79
CD4029	1.02
CD4030	.28
CD4035	1.02
CD4040	1.02
CD4042	.71
CD4043	.63
CD4044	.63
CD4046	1.67
CD4049	.36
CD4050	.36
CD4051	1.13
CD4060	1.42
CD4066	.71
CD4068	.40
CD4069	.40
CD4070	.40
CD4071	.28
CD4072	.28
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20	.29	40	.57

3 level wire wrap gold.
14 pin .25
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CIRCLE INQUIRY NO. 79

The Human-Dolphin Interface

By Mathew Tekulsky

Although John Lilly began trying to establish communication between humans and dolphins back in 1955, he terminated his research in 1968 because, as one observer put it, "he was way beyond where the technologies were." Now, however, the advent of advanced technologies have made it possible for him to resume his quest, and at the Human-Dolphin Foundation in Malibu, California, he's doing just that.

"The new science of computers and software has opened up new possibilities of relationships with other intelligent species including the dolphins," states Lilly. "To be able to break through to understand the thinking, the feeling, the doing, the talking of another species is a grand, noble achievement that will change man's view of himself and of his planet."

Lilly's experiment is called Project JANUS (Joint Analog Numerical Understanding System) and is named after the mythological two-faced god. The human side is for communication in the air and the dolphin side is for communication in the water. In the middle is a PDP-11 minicomputer, which will convert human speech into supersonic dolphin sounds and the dolphin's high frequency noises into the human hearing spectrum.

Operating under the assumption that dolphins (and other Cetacea, or whales) have a thinking capacity equal to, if not greater than, humans, Lilly is developing a list of frequency levels that the dolphin can match, and hopefully understand. This new language will be perfected with dolphins in captivity, after which Lilly plans to use a portable unit, such as a 26-foot mobile home to transport the computer to the sea. There, an attempt will be made to communicate with dolphins in their natural environment.

Lilly thinks communication with dolphins is possible within five years and will cost around $1 million. He's already raised $150,000 for the computer equipment through the foundation, which is a public research organization with a membership, and the projected budget for this year is $125,000. Supporters of the program include Burgess Meredith, who helped found the Human-Dolphin Foundation with Lilly and his wife Antonietta, as well as John Denver and Carroll O'Connor.

Although he's currently using some of the most sophisticated computer equipment available, Lilly wasn't always this fortunate. Dennis Kastner, who developed the hardware system now in use, explains:

"John originally tried to do something like this in the early '60's on the LINC computer and he had to sit there and toggle the bits by hand. Ones and zeros! Eventually new technologies came along, such as new electronics, minicomputers, mass storage devices, high speed analyzers and the rest of it. But the thing that's allowing us to do this particular piece of research is that the minicomputer has become less expensive, more available and more powerful.

"It started with the PDP-8 from Digital Equipment Corporation, and then along came the minicomputer revolution in the early '70's and that's what John was waiting for. Now the PDP-11, which is 80 times faster and has eight times the memory of the LINC, can do in one second what it took Lilly a week to do before. So the key is real time. That's what this system is all about. And Lilly's saying 'Finally!' "

The reason the PDP-11 was chosen was because its hardware architecture, which is based on a UNIBUS structured system, will accommodate upward compatible hardware and software so the system can grow. From the initial purchase of the central computer in June, 1977, the hardware has made quantum leaps.

"It's absolutely incredible," says Kastner. "All I had was a huge pile of documentation and the box (computer) and some floppy disks and from that I had to create the operating system. We grew this thing one element at a time, but it was a parallel process, not a linear process, which would have taken years and years."

The result is a total system in which all the pieces are significant and related. Each of the instruments was made as smart as possible. They do their own work and talk to the PDP-11 in finished information. But despite its sophistication, the computer is basically just a telephone system, one end serving a customer in the water and another serving a customer in the air.

In addition to the PDP-11, the system has a "voice" in the form of a Wavetech 159 programmable signal generator, and "ears" in the form of an SD (Spectral Dynamics) 350-6 spectrum analyzer. Hydrophones and amplifiers are also used to help transmit and receive signals.

The Wavetech tells the computer which whistles to put out and sends it underwater through a hydrophone amplifier. Sounds from the dolphin come in through the hydrophone and are picked up by the amplifier, recorded on a high frequency tape recorder and looked at by the spectrum analyzer. The computer then reacts momentarily and sends out a response.

The spectrum analyzer was custom-built for Lilly (it took four months) and is a variation of the one that was used on the latest Venus probe to calculate the doppler shift as the spacecraft went away from and toward the receiving station on earth. There is no other instrument in the world like it.

Larry Marchman, who developed the software for the system, says of the spectrum analyzer, "It analyzes the frequencies of sound we're receiving, and we can under computer control dynamically alter the range of frequencies that we're listening to. So if we put out a frequency under water and the dolphin doesn't hit it exactly, but comes close, we'll give him what he gave us. We know the frequency range where he talks and we're going to try to catch him in the band from 4,000 cycles per second to 80,000 cycles per second."

Since human hearing in air is from 20-20,000 cycles per second, many of these sounds are inaudible. However, they appear visibly on the spectrum analyzer. And although the bottle-nosed dolphin, on whom Lilly is concentrating his efforts, has a hearing range from 3,000-150,000 cycles per second, the spectrum analyzer can go up to 300,000 cycles per second under water — and it can scan that every 300 microseconds!

It is because of such advanced capabilities that the computer, according to Kastner and Marchman, is "totally essential to the experiment." It can operate 24 hours a day, a valuable feature since dolphins don't sleep for eight hours, as humans do, and it collects and correlates all of its data. The memory capacity is 64K, of which 8K is taken up by the UNIBUS addresses. The rest, or 56K, is available for programs.

And speaking of programs, the software for the experiment, which is also called JANUS, is completely homegrown. It's in assembler language (Macro 11) and most of it was written by Marchman.

"You can think of it as computer-aided instruction," he says. "The software is like a simulator and it exercises both the human and dolphin participants at whatever level they're capable of interacting. The purpose of this is to develop a relational database of symbol assignments, or word meanings, including a dynamic update of element relationships."

What this means is that teaching a dolphin a new language is similar to teaching a child to speak. Phonemes, the smallest stand-alone parts of a word, are learned first and are then combined to make single words, which are combined to make sentences. While this takes place, a protocol of interaction, or knowing when it's one's turn to speak, is established.

The same thing is taking place with the new language for the dolphin. First the computer will send out a "beep" at a certain frequency. If a "beep" at the same frequency comes back from the dolphin, there is a "match." This game of "sonic matching" will be played until 64 phonemes are created. If this sounds small, consider the fact that the English language has 44 phonemes, the permutations of which are enormous. The actual construction of the language will be a dynamic process that will involve the input of the dolphin and the human.

Once the dolphin understands the relationships between wave frequencies and the meaning of certain words such as "ball" and "food," qualitative meanings such as "true" and "false" will be developed. Eventually, humans will be able to speak directly into the computer in any language, and the computer will translate human speech into wave frequencies (the third language) that the dolphin will understand. The dolphin's response will then be translated by the computer into human language. Thus, direct communication between human and dolphin will take place — in real time!

And what then?

"Once you have the language," says Marchman, "you can shrink it down and put it into a microcomputer, like Speak and Spell, which is a $50 product with three chips that has 200 words on it. Then you'd have small communicators available at a very low cost, say $500, so many people could go on a boat or to oceanarias and communicate with dolphins.

What will the benefit of this be?

"Of what use is a new-born baby?" replies Kastner. "The dolphins are for everybody and regardless, it allows us to have a better perspective on the oceans, which are a new frontier on which we're having a tremendous impact. But we're doing it blind. So perhaps by communicating with the dolphins and whales, we'll get a better understanding of resource management in the oceans, which are 71% of this planet."

Lilly chose the bottle-nosed dolphin primarily because of the similarity between its brain (1600-1800 grams) and the human brain (1400 grams). Among land animals, we haven't been able to get very far with chimpanzees (brain size of 150-400 grams) and the only animal with a larger brain than man is the elephant.

But in the sea, things are different. "Among the Cetacea there is a continuous spectrum of brain sizes ranging from the ape size all the way up to six times the human size (in the sperm whale). We deduce that the human-sized brains in Cetacea correspond to human computational power and that the larger cetacean brains are capable of extensions of computations into the past and into the future beyond the range of the human," Lilly says.

Kastner explains this in terms of computers:

"There are things you just can't do on a microcomputer that you can do on a minicomputer and there are things you can't do on a minicomputer that you can do on a full-blown big computer. The sperm whale is a lot closer to the giant megacomputers than he is to this little one we have here. So his brain in relation to our brain is in the same kind of ball park."

But the whales are not only potentially more intelligent than we are. They've been around a lot longer too.

"Cetaceans evolved brains the size of ours thirty million years ago," states Lilly. "Our brains have only been their present size for approximately 100,000 years. We, as relative newcomers, may be asking too much of ourselves to communicate meaningfully with minds as ancient as those of the whales and dolphins. This program may be far more important than we currently conceive it to be: the whales and the dolphins may have more to teach us than we have to teach them."

One of the things they could teach us is how they have managed to survive in harmony with their environment for millions of years. Perhaps by learning the key to their survival, we may discover the key to our own.

If the current experiment works, the JANUS software could also be used to develop communication with other animals, such as elephants. Lilly even considers the possibility that these interspecies negotiations are actually a "preparation for contact between this planet and extraterrestrial observers from other parts of the galaxy."

According to Kastner and Marchman, if man needs to deal with extraterrestrials or other intelligences, and this creature has a language and signals in a physical medium that we can measure, we'll be able to create a language with him using the same basic programs as JANUS. So they're actually in training, they say, for the real close encounters of the third kind.

The commercial benefits of communication with dolphins include learning new methods of culture of plants and animal sea organisms, the unnecessary destruction of nets and capturing of dolphins by fisheries and the use of whales by offshore oil-drilling industries to detect oil leaks and act as guides to the ocean floor. There's even something in it for the computer industry.

"The modern microprocessors and minicomputers designed for use in salt-air environments are the basis for the breakthrough in communication with Cetacea," Lilly says. "Once the communication breakthrough is made with special methods, manufacturers of the necessary equipment will have a ready market.

"The development of satisfactory programs for the use of the computers for efficient high-speed communication with Cetacea will go concurrently with the computer work. Each use in the communication field will require its own software. As the use of computers for these purposes expands, so will the market for special software increase."

However, the greatest contribution of human-dolphin communication would be the establishment of a new set of belief systems pertaining to the conservation of the earth's natural resources. Lilly hopes that new laws will be passed to protect the whales, and he would like to see oceanaria become educational centers where humans and dolphins can interact and learn from each other and where dolphins will volunteer for "limited terms of service" during which they'll be provided with telephone communication from tank to tank and out into the human world. He even foresees a United Nations representation of Cetacea, who will "insist that human warfare stop" and will "establish the oceans as off limits for human military actions against either cetaceans or other humans."

Although these predictions may seem far-fetched, Lilly contends that "many science-fiction writers (in the past) have made projections into the future that have become realized. Without such projections, man does not change his ways." Therefore, to Lilly the possibilities that his visions of the future will come to pass "seem most likely."

But for now, the basic problem for the dolphins, and especially for the larger whales, some of which are already threatened with extinction, is survival.

"What it amounts to," says Burgess Meredith, "is that we are in a race to speak to the whales and dolphins before they are destroyed. Like a Greek drama, the tension is great and the outcome is uncertain."

Hopefully, by getting to know the dolphins and the great whales through communication, we'll be more inclined to preserve, and learn from these wonderful creatures of the sea.☐

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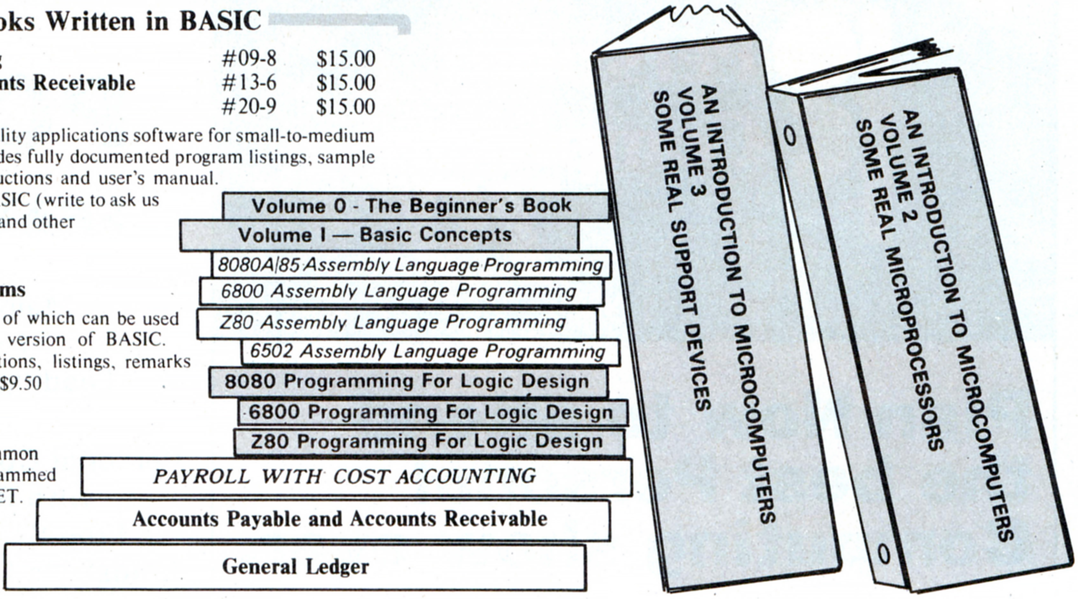
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The Pascal Notebook
Chapter 2

By Henry Davis, Associate Editor

The first chapter covered semantics and began a discussion of parsing. Chapter Two continues with these control structures, and begins an explanation of Bachus-Naur Forms.

Road Map — Chapter 2

Implied Semantics page 97
Bachus-Naur Form (BNF) page 99
Syntax Graph page 99
Control Statements page 100
Begin-End page 102
Case page 102
While page 102
If-Then page 103

IMPLIED SEMANTICS

Earlier it was implied that production rules specified only syntax, and did not include semantics. Within the confines of certain languages, most notably programming languages, some aspects of semantics are conveyed by syntax. Consider the language of expressions in Example E5.

Example E5

E5.1 S→A|S-A
E5.2 A→a|b|c

Several sentences belong to this language, including:

E5.3 a
E5.4 b
E5.5 c
E5.6 a-a
E5.7 a-b
E5.8 b-a
E5.9 a-c-b
E5.10 a-b-c

Because these sentences are generated in a certain order, an implied parenthesization is defined by the syntax. Implied parentheses in the sentence a-b-c yields the form ((a-b)-c) with explicit parentheses. By transforming the grammar of Example E5 into the syntactically equivalent form that is required, it becomes apparent that the implied semantics were not equivalent. The transformed grammar is:

Example E6

E6.1 S→A|A-S
E6.2 A→a|b|c

The sentences of this language are identical in form to those of Example E5. However, the subtractions of the sentence a-b-c are generated in a different order.

Now the sentence a-b-c has another different and unequal structure: (a-(b-c)). When considering the usual meaning of subtraction, the two forms are not semantically equivalent.

Two points are evident from the discussion of Examples E5 and E6. First, it is not in general possible to satisfy rules R1 and R2 by rewriting the grammar without affecting the semantics. That is, a grammar with left recursion (the property forbidden by rules R1 and R2) may not be semantically equivalent to an equivalent grammar which is left recursion free. Second, when inherent meaning is present in a language being defined (such as the syntactic rules for expressions), the syntactic structure must reflect the semantic structure.

The approach used in the preceding sections is a Top-Down recognition algorithm and applies to grammars which are not left recursive (rules R1 and R2 apply). In order to use our intuitive approach in a computer for compilation purposes, it is necessary to convert this algorithm into an actual program.

The Top-Down parsing algorithm has the desirable characteristic that the goal of the process is known at the outset. The goal, recognition of a sentence, is split into subgoals by the application of a production. Applying a production rule replaces a single non-terminal symbol by a sequence of symbols, each of which is pursued in a single order. An example of subgoal generation is shown below.

Example E7

E7.1 S→AB
E7.2 B→a|b
E7.3 C→c|d

Parsing the sentence bd begins with the primary goal: sentence recognition and the start symbol, S. Next E7.1 is applied, the two subgoals are generated: recognition of A and recognition of B. Now E7.2 and E7.3 are applied and the recognition is complete.

Because the initial goal is divided into subgoals and each of these goals is further divided, the Top-Down parsing algorithm is also referred to as goal-oriented parsing. Each non-terminal of the language corresponds to a symbol for the parsing algorithm. By capitalizing on this correspondence it is sufficient to construct subparsers for each non-terminal symbol. The goal of each subparser is to recognize a subsentence that can be generated from its corresponding non-terminal symbol.

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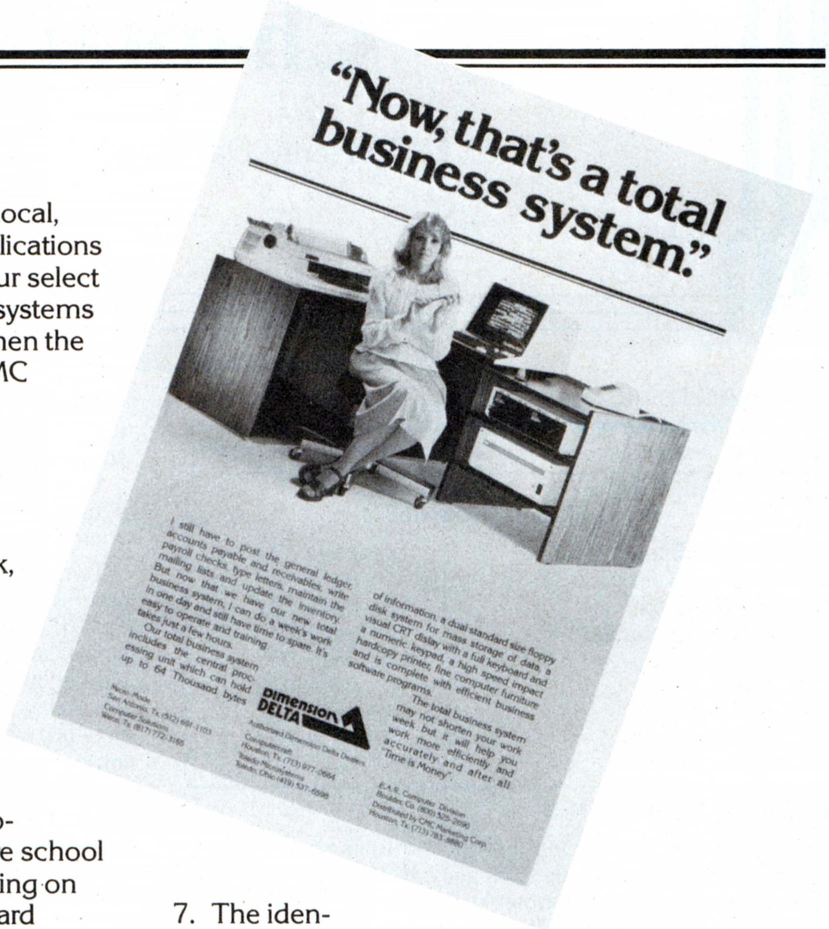

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For the sake of convenience, it is desirable to represent the syntax (productions) in terms of graph structures. These recognition-graphs or syntax-graphs are more easily understood at a glance and furthermore correspond to the program flow of the parser.

Because the production rules of programming languages usually use BNF notation (Bachus-Naur Form), we'll digress for a moment to explain BNF. BNF was first used in the definition of the programming language ALGOL-60. Like the other symbolism in formal languages, BNF uses angle brackets, <>, to denote sentential constructs. The non-terminals have the same use as has been described before. The right arrow, →, is replaced by the symbol "::=" and has the same meaning. The bar for "or" remains in BNF. These basic symbols of BNF are called metasymbols, because they are symbols used to describe and define symbols. Repetition of symbols is explicitly denoted by braces, { }, and may include from no repetitions to as many as necessary.

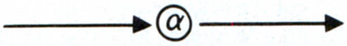
SYNTAX-GRAPH

Syntax-graphs are produced from BNF notation by using a few simple rules (from Wirth).

Rules of Syntax-graph Construction

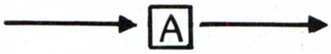
Rule R3. Every non-terminal symbol, A, is mapped into a recognition-graph A, with a structure determined by the right side of the production according to rules R4-R8.

Rule R4. Each occurrence of a terminal symbol corresponds to a recognizing statement for the symbol. Graphically if α is a terminal:



Here the arrows indicate flow and are most easily verbalized as "an" for arrows pointing to a circle or square, and as "and" for arrows leaving a circle or square. Thus, the syntax-graph of Rule R4 can be verbalized as ". . .an alpha and. . .". Whenever a terminal symbol occurs in the BNF notation, we represent it by the terminal in a circle. Squares are used to indicate a non-terminal symbol.

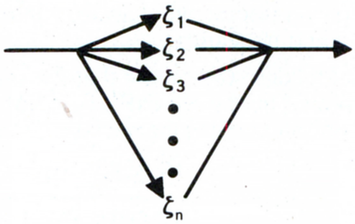
Rule R5. Each occurrence of a non-terminal symbol, A, corresponds to the actuation of the recognizer, A. Graphically:



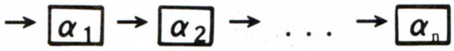
Rule R6. A production of the form:

$$A ::= \zeta_1|\zeta_2|\zeta_3|\ldots|\zeta_n$$

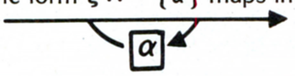
maps into the graph:



Rule R7. A ζ of the form: $\zeta ::= \alpha_1\ \alpha_2 \ldots \alpha_n$ yields the graph:



Rule R8. Any ζ of the form $\zeta ::= \{\alpha\}$ maps into



These rules are applied repeatedly, recursively in fact, until each non-terminal has been reduced to graphs using only terminal symbols. To see how these rules are used to generate syntax-graphs, consider Example E8.

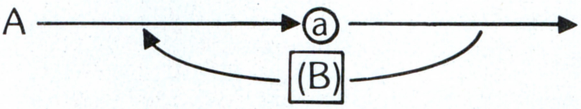
Example E8

E8.1 A ::= a|(B)
E8.2 B ::= AC
E8.3 C ::= {/A}

Sentences generated by this grammar consist of expressions using the operator,/, operand,a, and parenthesis. Some of the sentences include:

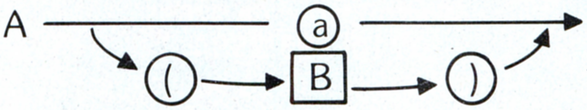
a
a/a
((a))
(a/a)

By applying the rules R3-R8, a single graph representing the syntax of the grammar can be constructed. First, apply rule R3, which says this grammar can be represented by a graph, then apply rule R6, giving:



This graph means that an A is an a or a (B).

Now rule R4 must be applied since "(" and ")" are terminals. This gives us:



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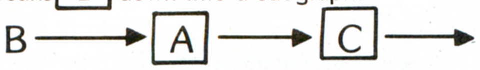
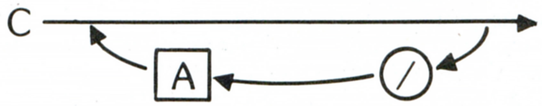
The lower branch says that an A is a left parenthesis and a B followed by a right parenthesis.

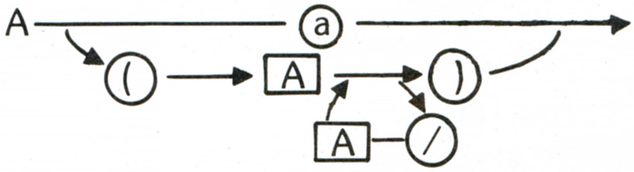
Rule R6 breaks $\boxed{B}$ down into a subgraph.



Again, applying rule R6 $\boxed{C}$ can be written as:



Combining these three graphs produces a reduced syntax-graph corresponding to the grammar of Example E8.



This graph is equivalent to the BNF representation of the language programmer. Note that this graph is recursive. That is, the graph of A includes the use of A in its definition. The only way in which the traversal through the syntax-graph can terminate is to pass through the branch containing the ⓐ node.

By rewriting the BNF rules as syntax-graphs, language structure becomes more obvious. Because of the clarity, many language designers begin with syntax-graphs rather than BNF during the design process. Questions regarding the language are easily answered by a visual analysis. For example, testing a language to verify that it is free of left recursion can be stated in simple terms. Rule R1 becomes:

> At every fork the branch to be followed is determined by the symbol on the branch; no two branches begin with the same symbol.

Rule R2 is now:

> If a graph can be traversed without reading an input symbol (a null sentence is allowed) the null branch must be labeled with all symbols that may follow it.

The resulting syntax-graph is a deterministic syntax-graph and forms the basis for deriving a program which accepts (and parses) the language. As was indicated earlier, the graph basically represents the parsing program's flowchart.

CONTROL STATEMENTS

In order to perform useful work, a programming language needs to have program control statements. Exactly which constructs are necessary has been a source of controversy for some time. Compilers are a good prototype for language constructs, since a wide variety of operations are performed. The following discussion indicates some of the basic control and grouping structures.

In what follows we assume that the sentence to be parsed is represented by the file INPUT. SYM represents the next symbol, and stepping to the next symbol is expressed by

READ(SYM)

PROGRAM 1

```
PROGRAM PARSEXAMPLE8 (INPUT,OUTPUT);
  PROCEDURE A;
  BEGIN IF SYM = 'a' THEN READ(SYM) ELSE
    IF SYM = ')' THEN
```

PROGRAM 1 (Continued)

```
  BEGIN READ(SYM);A;
    WHILE SYM ='/' DO
      BEGIN READ(SYM);A;
      END;
    IF SYM = ')' THEN READ(SYM) ELSE ERROR
  END ELSE ERROR
END;
BEGIN READ(SYM);A
END
```

The parsing routine now consists of a main program with an initial READ to obtain the first symbol, an activation of the main parsing goal, and a series of individual routines corresponding to parsing goals. If S is the syntax-graph then T(s) is the translated statement obtained by the rules as follows:

Rule R9. Reduce the syntax-graphs to as few individual graphs as possible.

Rule R10. Translate each graph according to rules R11 through R15.

Rule R11. A sequence of elements

$$\rightarrow \boxed{S_1} \rightarrow \boxed{S_2} \rightarrow \ \ldots \rightarrow \boxed{S_n}$$

becomes the compound statement

$$\text{Begin } T(S_1); T(S_2); \ldots T(S_n) \text{ END}$$

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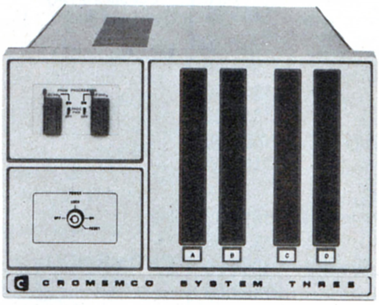

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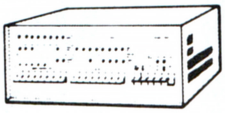

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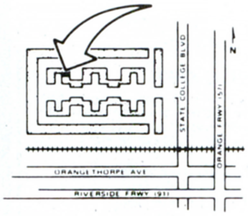

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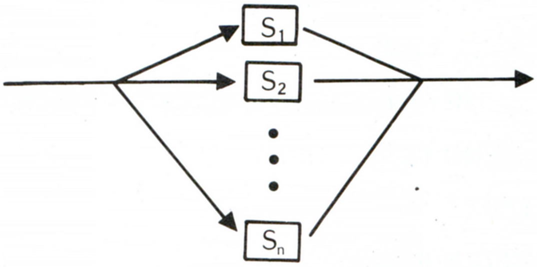
The BEGIN-END pair form a sort of "fat parenthesis" and allow the statements in between to be considered as a single entity. Additionally, the pair aids in visual grouping so the source text is more readable.

Rule R12. A branching structure giving a choice of elements like



is a selection or conditional statement, and is represented by:

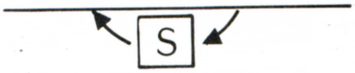
CASE SYM OF
L_1: $T(S_1)$;
L_2:$T(S_2)$;
L_n: $T(S_n)$
END

or

IF SYM IN L_1 THEN $T(S_1)$ ELSE
IF SYM IN L_2 THEN $T(S_2)$ ELSE
IF SYM IN L_n THEN $T(S_n)$

Where L_1 is the set of initial symbols of the branches. Both forms allow us to test for membership in a set.

Rule R13. Loops of the form:

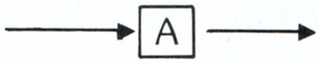


are translated into the repetitive statement

WHILE SYM IN L DO T(S)

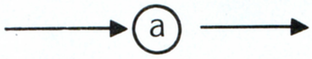
where L is the set of initial symbols.

Rule R14. An element denoting another graph:



becomes a call to procedure A.

Rule R15. A terminal symbol in the graph:

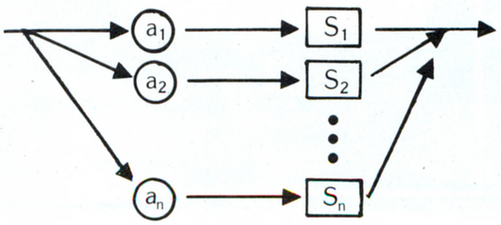


is translated into the statement

IF SYM = a THEN READ (SYM) ELSE error

By applying these rules to the syntax-graphs of Example E8 the recognizer program (program1) is obtained. One liberty has been taken in producing this program — obvious programming simplifications have been made. These general reductions should now be incorporated into the rules for graph translation. The first is related to rule R12 and is really a special case.

Rule R16.



Which is represented by:

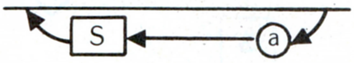
```
IF SYM = '$a_1$' THEN BEGIN READ(SYM);
           T($S_1$) END ELSE
IF SYM = '$a_2$' THEN BEGIN READ(SYM);
           T($S_2$) END ELSE
                •
                •
                •
IF SYM = '$a_n$' THEN BEGIN READ(SYM);
           T($S_n$) END ELSE
```

or

```
CASE SYM OF
'$a_1$': READ(SYM); T($S_1$);
'$a_2$': READ(SYM); T($S_2$);
       •
       •
       •
'$a_n$': READ(SYM); T($S_n$);
END
```

The second optimization relates to rule R13 in much the same way:

Rule R17.



is translated to:

```
WHILE SYM = 'a' DO
BEGIN READ(SYM); T(S) END
```

One last optimization adds a potential construct to our language — the REPEAT statement.

Rule R18. The construct:

```
READ(SYM); T(S);
WHILE B DO
   BEGIN READ(SYM); T(S) END
```

which occurs frequently, is replaced by the equivalent but more compact form

```
REPEAT READ(SYM); T(S) UNTIL B
```

In case these control structures are not familiar to you, Figure 3 gives the standard flowchart representation.

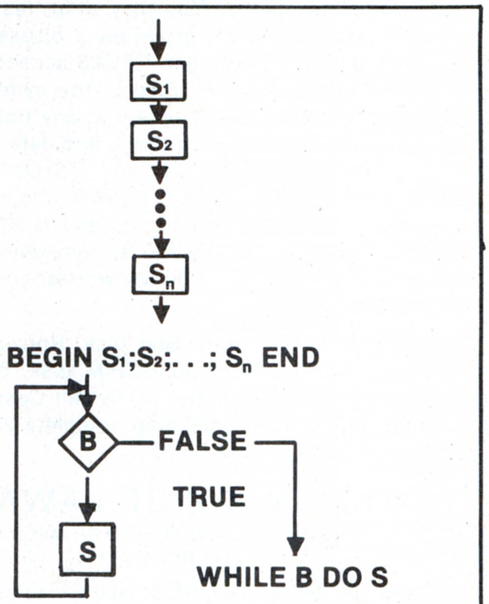


Figure 3 Continued Next Page

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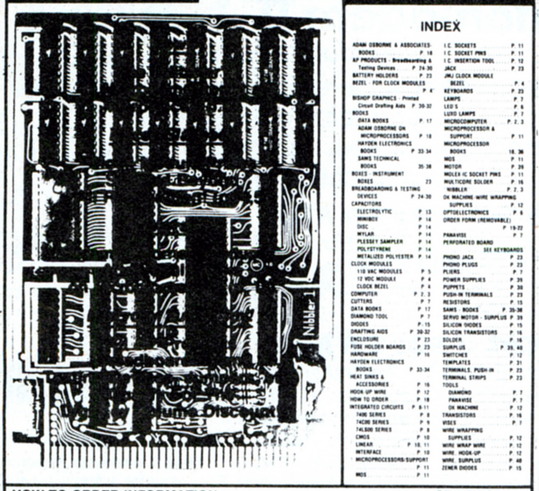

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Figure 3 (Continued)

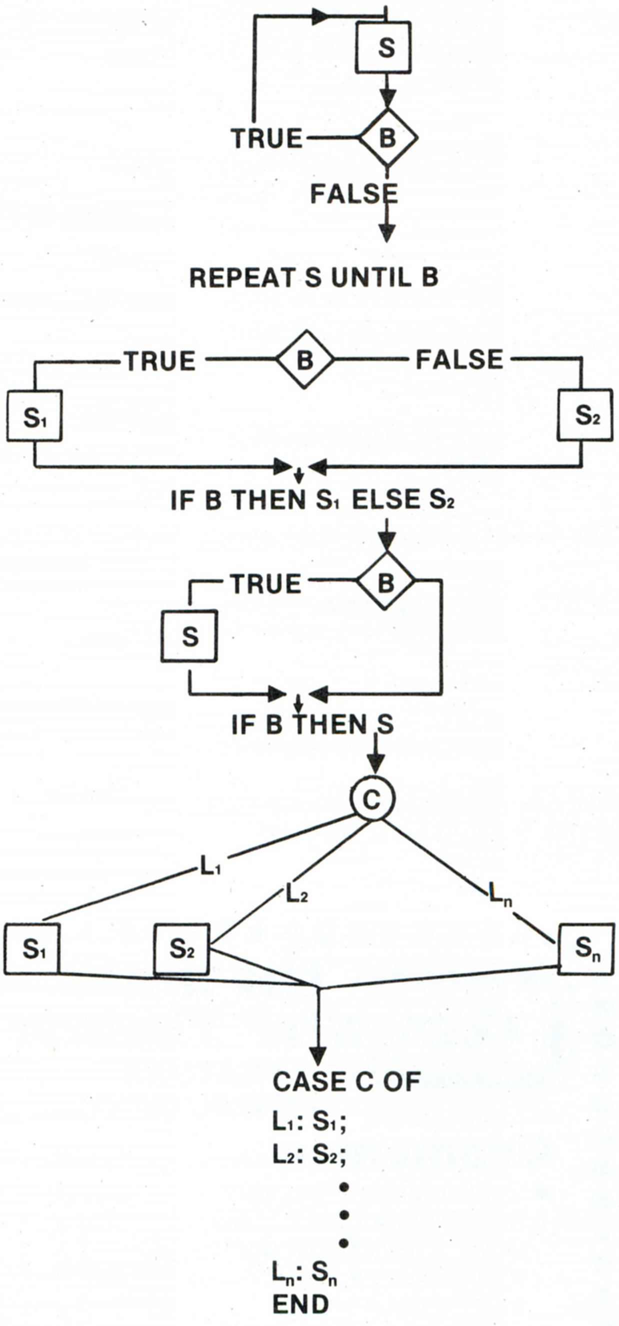
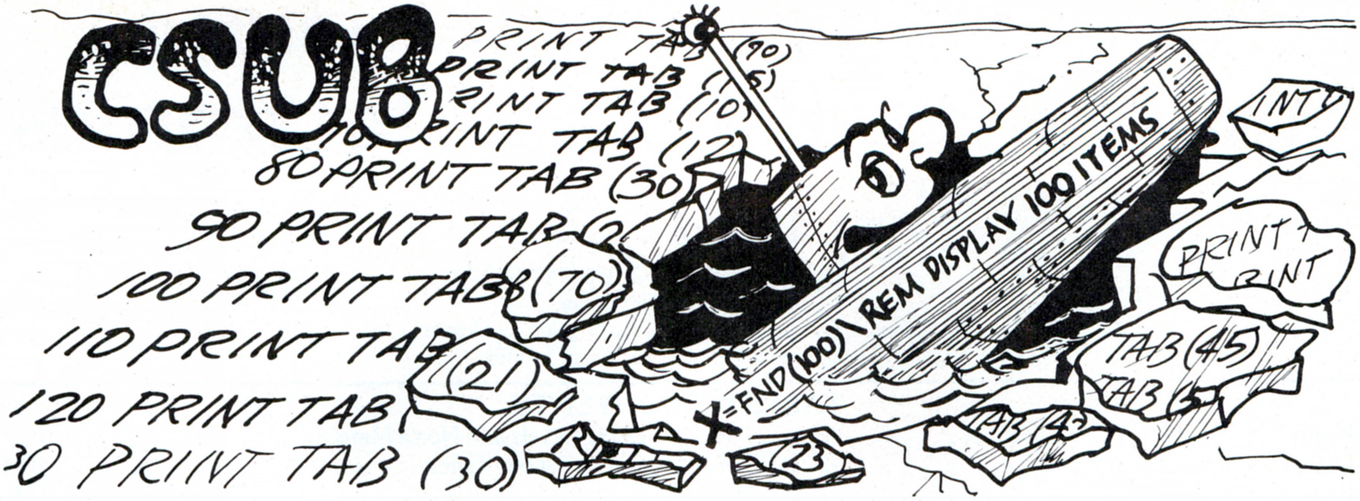


Figure 3.

Chapters One and Two have introduced one aspect of Pascal, the control structures, by examining the formal basis of language definition as applied to compiler writing. While it is perhaps the most difficult subject in terms of mathematics, parsing and its related language restrictions are less than ten percent of the "meat" of Pascal. Parsing is revisited in a later chapter on compiler implementation.

Chapter Three starts filling in the gaps of these two chapters by treating data structures and their application to programming in general and compiler writing in specific.☐

The author can be contacted at American Microsystems, Inc., 3800 Homestead Road, Santa Clara, CA 95051. Phone (408) 246-0330. All references will be published at the end of the series.



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Unit 4 showed how Boolean algebra was applied to switching simplification, and also displayed the input-output relationships of four basic flip-flops. The introduction to "Logic Families" set this month's format for a more detailed discussion on logic families which also provides a basic platform from which to view the microprocessor as a systems component.

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ICs are a combination of interconnected circuit elements monolithically (inseperably) situated on or within a continuous supporting material (substrate). These circuits are considered to be in the realm of microelectronics. The "Planar Process" is the method used to produce circuit elements such as transistors, diodes, capacitors and resistors in the silicon material. This same process has also been used for some time in the production of discrete (separate and distinct) transistors.

We find the subject of integrated circuits divided into two categories, Digital ICs and Linear ICs. Naturally the study of computers encompasses the digital IC; however, in certain peripheral devices linear ICs are also utilized. The term "linear" here refers to analog circuitry, whereas the elements of electricity (current and voltage) are controlled or varied continuously, over the period of operation. In contrast, digital circuits switch suddenly from one predetermined level to another.

It may seem that ICs would be implemented 100% in the design and operation of equipments. This, of course, depends upon circuit and device requirements, such as energizing solenoids, relays, motors, mechanisms of sorts, all of which require fair amounts of power. Since ICs are low current/voltage and power devices, we have to resort to discrete devices that are capable of handling these higher power requirements. However, the IC (linear and digital) may be utilized in the processing, and control functions at lower power levels, to control the higher power discrete solid state devices which in turn activate the power mechanisms themselves.

DIGITAL INTEGRATED CIRCUITS

Since our series is computer oriented, our principal concern is on digital ICs. Before commencing our overview of the various logic families, we shall define the so-called mystic terminology surrounding the digital IC. To escape a point of misconception and confusion, we must look into one of our leading solid state manufacturer's (Texas Instruments) clarification of gate equivalent circuit: "A basic unit of measure of relative digital-circuit complexity. The number of gate equivalent circuits is that number of individual logic gates that would have to be interconnected to perform the same function."

SSI — SMALL SCALE INTEGRATION
Up to approximately, 10 to 12 equivalent gates.

MSI — MEDIUM SCALE INTEGRATION
From approximately 12 to 100 equivalent gates.

LSI — LARGE SCALE INTEGRATION
100 or more equivalent gates.

VLSI — VERY LARGE SCALE INTEGRATION
1,000 or more equivalent gates.

TERMINOLOGY

V_{IH} — High level input voltage (Minimum required for *logic one*)

V_{IL} — Low level input voltage (Maximum required for *logic zero*)

V_{OL} — Low level output voltage (Maximum required for *logic zero*)

V_{OH} — High level output voltage (Minimum required for *logic one*)

I_{IH} — High level input current

I_{IL} — Low level input current

I_{OH} — High level output current

I_{OL} — Low level output current

Passive Element
Incapable of gain or control (Example: capacitor or resistor)

Active Element
Capable of gain or control (Example: transistor)

Threshhold Voltage
The input voltage level of a logic circuit at which the circuit changes from one level to the other.

Noise Margin
The maximum value of noise voltage (undesirable) that the circuit can tolerate without changing states.

Bipolar Device
A transistor in which there are both majority and minority current carriers.

Unipolar Device
A transistor in which the current carrier is of only one polarity. (Example: Field Effect Transistors)

Propagation Delay Time (TPD)
The average of the delay times from logic low to high (tpdh) and logic high to logic low (tpdl).

Power Dissipation
Power consumed by a logic circuit operating with a 50% duty cycle.

Fan In
The number of inputs a logic gate can accommodate.

Fan Out
The number of logic inputs that the output of a logic gate can drive.

LOGIC CIRCUITS

If we have three variables (A, B and C) we can make each of them correspond to a point of the circuit that will be energized according to the value of the variable.

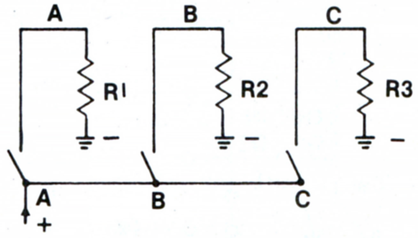


Figure 103. Voltages representing variables.

RESISTOR LOGIC

If we connect points A, B and C of Figure 103 through buffer (isolation) resistors Rs to a common point S, as shown in Figure 104, then whenever a voltage appears at the top end of one of the resistors (R1, R2 or R3), there will also be a voltage at point S.

Therefore, point S will have a certain voltage when there is a voltage at points, A or B or C, or at two or all three of these points. So, the inclusive "OR" condition is satisfied and we can state that:

$$S = A + B + C$$

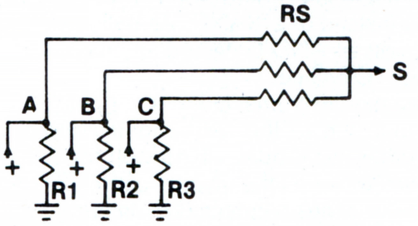


Figure 104. Resistor "OR" circuit.

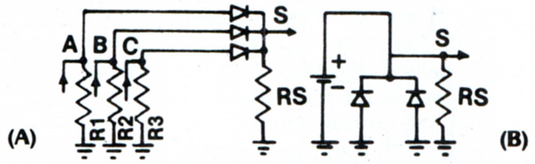


Figure 105. Diode "OR" circuit.

When the number of input circuits is large, the voltage is reduced so much that its decision is difficult. In order to eliminate this voltage dividing action of the other input circuit, the circuit must be modified.

DIODE LOGIC

At point A of Figure 105 we see the same circuit as in Figure 104, but with germanium crystal diodes replacing the buffer isolation resistors.

Note at point B of Figure 105 that when only one input is energized, no voltage dividing action occurs at the other inputs, since the diodes of the other inputs are then reverse biased and act as open switches. Therefore, the same value of voltage appears at point S as is applied to the point energized, and the voltage at point S does not depend on the number of input circuits employed.

TRANSISTOR LOGIC

Transistor logic circuits may be grouped according to similar general characteristics as follows:

Group No. 1 — Current Sourcing
Group No. 2 — Current Sinking
Group No. 3 — Current Mode

The terms "Current Source" and "Current Sink" are conveniently explained by means of a common analogy: the ordinary kitchen sink, where the water tap is the "source" and the "sink" is the place where the water goes.

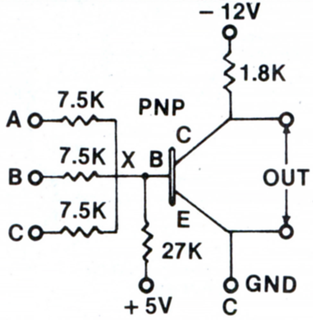
In some types of logic circuits, the current must flow from an output and be channeled into the input of a similar circuit in order to activate the output of the gate. It is said to resemble the water tap inasmuch as it is a "source."

In other types of logic circuits, the current must flow "out" of its inputs. Thus, the output stage of a circuit that precedes the gate is said to resemble the "sink" in that it must provide a place for the outflowing current to go.

Current Mode Logic (CML) circuits may either "sink" or "source" current, and are found in several forms. The name current mode itself is derived from the ability of these circuits to change logic levels by switching between two active current levels or modes. They generally employ emitter follower, or emitter-coupled circuitry, and for that reason this type of logic is also known as "emitter-coupled-logic" (ECL).

RESISTOR-TRANSISTOR LOGIC

In Figure 106 we show a typical NOR gate in a resistor-transistor logic (RTL) system where the gating structures are in the form of resistors and transistors only. This was the first family of logic circuits established as a catalog line.



A	B	C	OUT
0V	0V	0V	−12V
0V	0V	−12V	0V
0V	−12V	0V	0V
0V	−12V	−12V	0V
−12V	0V	0V	0V
−12V	0V	−12V	0V
−12V	−12V	0V	0V
−12V	−12V	−12V	0V

SIGNALS

A	B	C	OUT
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

TRUTH TABLE

$$Z = \overline{A+B+C} = \overline{A} \cdot \overline{B} \cdot \overline{C}$$

Figure 106. RTL "NOR" gate.

The type of RTL shown in Figure 106, although quite popular some time ago in circuits employing discrete components, is rarely used in integrated circuitry because of the difficulty in fabricating circuits with precise resistance values and because of the greater speeds than can be attained with diode transistor logic, and transistor-transistor logic.

RTL NOR-GATE

The RTL-type NOR-Gate circuit shown in Figure 107 has three inputs, A, B and C. Its output will be a "1" (+5V) only when all inputs are at 0V. The output will be at 0V when any of the three inputs, A, B, or C, are positive levels above ground.

Circuits of the type shown in Figure 107 are incorporated in integrated circuit systems because the resistors are small and need not be of precise value. In addition, circuits are simpler and when good transistors are used they have fast response times. There is gain through every stage, which is an added advantage.

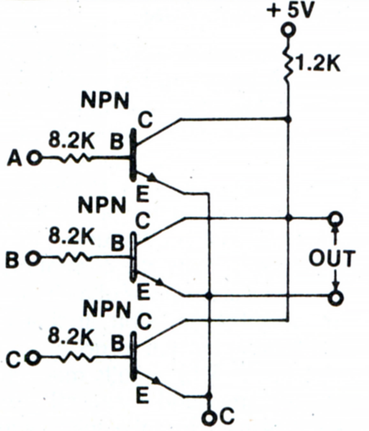


Figure 107. Three-input RTL "NOR" gate.

In the schematic diagram of Figure 108 we show the output of an RTL gate (of the type incorporated in ICs), driving the inputs of several other RTL circuits. The number of similar gates that can be effectively driven by the driving gate is called the "fan-out."

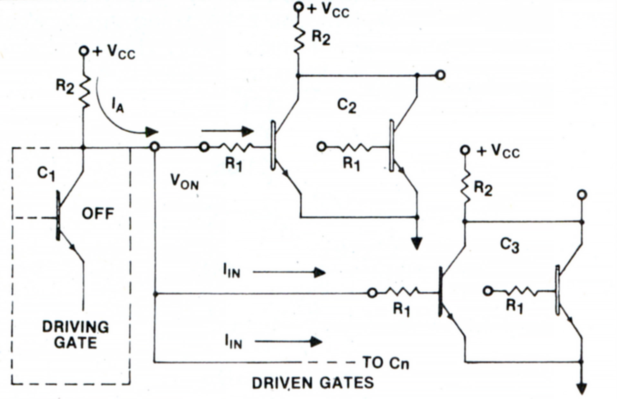


Figure 108. Typical RTL gate connection showing current sourcing.

One important difference in RTL families is speed. As the various RTL families use transistors which are essentially identical, speed variations are primarily a result of different resistance values. The higher the value, the lower the speed is.

CURRENT-SINKING GATES

The general characteristics of current sinking logic are enumerated as follows:

A. Logic current flows out of inputs.
B. Outputs "sink" drive current.
C. Gate performs the NAND function.
D. Highest voltage noise immunity.
E. DTL is NAND logic.

DIODE-TRANSISTOR LOGIC (DTL)

Figure 110 is the schematic diagram of a typical DTL NAND gate used in integrated circuits. Here the current flows from the circuit Db, Cc and Cn, representing current sinking (that is to say that the current must be drawn from the inputs).

What we have said about the speed characteristics for the RTL is also applicable to the DTL. Another method, however, is sometimes used to speed up circuits driving highly capacitive loads. In Figure 109 the load resistor RL is added in order to speed up the output turn-off time.

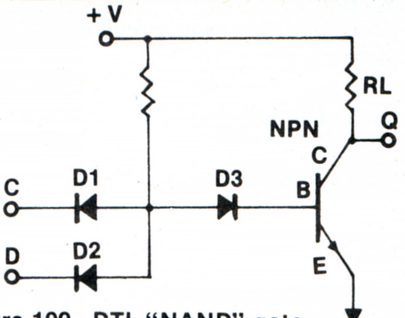


Figure 109. DTL "NAND" gate.

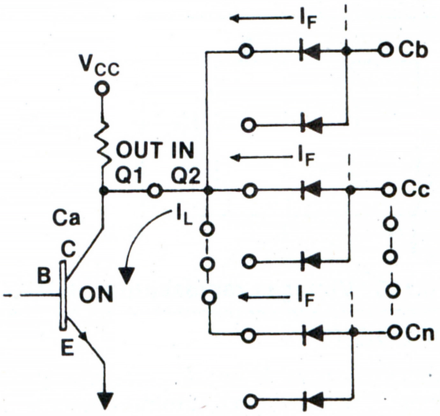


Figure 110. Typical DTL "NAND" connection showing current sinking.

ANALYSIS OF DTL NAND CIRCUIT

Figure 111 illustrates a popular DTL NAND-Gate circuit which we shall use to analyze the action of the NAND-Gate.

The circuit has three inputs, A, B, and C, and a single output. You will recall that the term NAND-Gate is a contraction of "NOT-AND-Gate," and sometimes is referred to as a NOT-AND instead of a NAND. Actually, it is a combination of two circuits: an AND-Gate and an Inverter which is sometimes called NOT-Gate.

The three diodes connected to the inputs and the 2k-ohm resistor connected to the +6V point constitute the AND-Gate; the other two diodes, along with the two resistors and the transistor, make up the inverter circuit. The transistor and the two diodes series-connected to its base are silicon semiconductors.

For reasonable variations of current through it, a forward-biased silicon diode will have a relatively constant voltage drop across it. Assuming conventional current flow (from positive to negative), the two diodes which are series-connected to the base of the transistor are kept permanently forward biased by the current which flows from the +6V point to the −3V point through resistors R1 and R3. Since the two diodes are silicon, they will each drop about 0.7V.

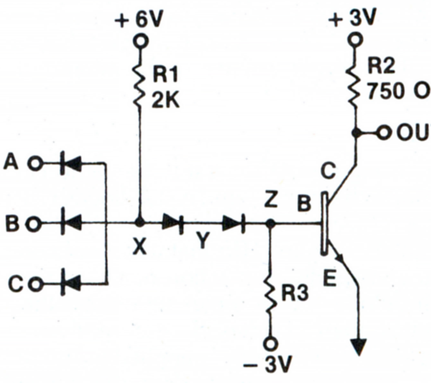


Figure 111. Typical DTL "NAND" circuit.

TRANSISTOR-TRANSISTOR LOGIC (TTL)

Resistor-Transistor Logic (RTL) and Diode-Transistor Logic (DTL) gates were generally found in logic board cards using discrete components, or in monolithic integrated form. However, the TTL type is found only in monolithic integrated form.

Since TTL is a current-sinking logic, it has been classed with DTL. Also, TTL is similar to IC-type DTL in several other aspects.

Comparison of TTL to DTL

Those comparing the IC type DTL and the simple TTL circuits illustrated in Figure 112 will discover that they differ only in their input circuitry.

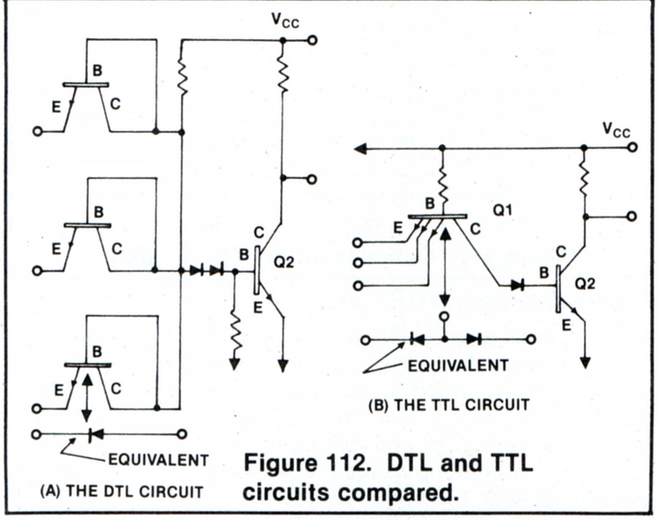


Figure 112. DTL and TTL circuits compared.

Note that the DTL circuit uses transistors, but their collector-base junctions are shorted. (The emitter-base diode has lower capacitance and lower forward voltage drop than the base-collector diode, and is used in preference to it, primarily because it exhibited faster switching characteristics.)

. As far as operation is concerned, the DTL and the TTL circuits are identical. A "low" on any input of the TTL Gate shunts current away from the base circuit of transistor Q2, and the collector output voltage of this transistor goes to a "high" level (logic 1).

With a high (positive voltage) on all inputs, the current flows through the base-collector diode of the multiple-emitter input transistor Q1 and the base-emitter junction of Q2, bringing the collector output of Q2 to a low level.

VARIOUS TTL GATE CONFIGURATIONS

TTL logic is one of the most popular forms used in high speed switching, computer and microprocessor systems. TTL logic families produced by various semiconductor manufacturers are similar in design in that all circuits employ multiple-emitter input transistors and some form of an active pull-up in the output stage. All TTL circuits will have either speed or power tradeoffs, depending upon the requirements of the system they are designed for, and will fall into one of the following three categories:

1. High Speed TTL — circuits that operate in the 5 to 10nsec range and consume relatively high power, 20 to 30mW per gate.
2. Medium Speed TTL — circuits that operate in the 10 to 25nsec range and consume a moderate amount of power, 10 to 20mW per gate.
3. Slow Speed TTL — circuits that operate in the 25 to 50nsec range and consume very little power, 1 to 10mW per gate.

These ranges are not absolute and may even overlap. They serve only as a guide to give an indication of the switching speeds and power consumption requirements of TTL families.

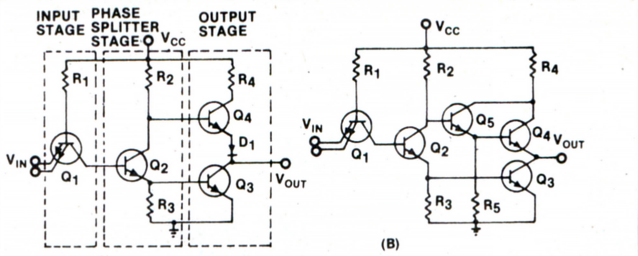


Figure 113. Basic TTL gate configurations.

A typical TTL gate, as shown in Figure 113a, can be divided into three functional sections — the input stage, the phase-splitter stage and the totem-pole output stage — and can be evaluated from this standpoint.

LOADING AND DRIVE CAPABILITIES OF TTL 74 SERIES ICs

To take an input to ground (logical LO) requires a source capable of sinking 1.6 ma. In calculating this figure, a 0v input-voltage is assumed (not over 0.4v). The 4k-ohm resistor is considered to have a tolerance of 30%; therefore its value may be as low as 2.8k ohms.

To drive an input to plus 3v (logical HI) requires a source capable of delivering 40 microamperes. This combination of drive requirements is referred to as a "unit load." Each gate is capable of driving 10 TTL unit loads, or in other words, each output has a "fan-out" of 10 (Sink 16 ma; supply 400 ua).

LOGIC LEVELS AND NOISE MARGIN

A gate input will recognize a 0.0v to 0.8v as a logical LO, and 2.0v to 3.6v will be recognized as a logical HI. In the logical LO condition an output is between 0.0v and 0.4v. The logical HI output condition is between 2.4v and 3.6v.

The worst case noise margin is 400 millivolts. That is, an output would have to make at least a 400 millivolt excursion to cause an input which is connected to it to go into the indetermined voltage region. As an example, if an output were at 0.4v (worst case logical LO) there would have to be a plus 400 mv swing in voltage to cause inputs connected to it to go into their indetermined region.

CURRENT-MODE GATES (Emitter-Coupled-Logic)

The general characteristics of current mode logic, also called Emitter-Coupled-Logic (ECL), are enumerated as follows:

A. Logic current is small and flows in or out of inputs, depending on circuit (high impedance input).
B. Outputs source and/or sink current (low impedance output).
C. Gates perform AND/OR functions (AND/OR may be inverted by common base stage to NAND/NOR).
D. Fastest logic form; non-saturating.

Both current "sinking" and current "sourcing" are rather straightforward; current "mode" logic circuits are more difficult to categorize. There are, however, some identifying characteristics.

CIRCUITRY

Figure 114 illustrates an example of current mode circuitry commonly used in integrated form. The peculiarity worth noting is its emitter-coupled, non-saturating circuit. The arrows indicate the relative voltage variations of points A and B with respect to V_{in}. More inputs may be provided by adding more transistors in parallel with Q1, as represented by Q_A drawn by a broken line. Since point A drives an emitter-follower, the output is in phase with point A. Likewise, the OR output is in phase with point B.

The emitter-follower output improves propagation time because it does not saturate, and therefore there is no delay due to storage time.

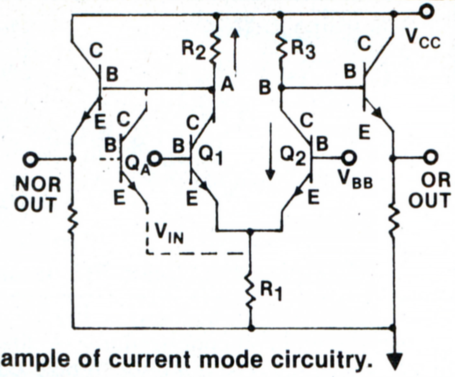


Figure 114. Example of current mode circuitry.

FIELD-EFFECT TRANSISTORS

Field-Effect transistors used in digital circuitry have definite advantages when compared with junction transistors. Among these advantages are high input impedance which results in high fan-out for many circuits, capacitive input (characteristic of MOSFETs) permitting direct coupled circuitry and lower component count, unique complimentary (CMOS) circuits which result in extremely efficient power dissipation characteristics.

MOSFET DIGITAL CIRCUITS

The MOSFET has some very definite performance advantages when compared with junction transistors and junction FETs. The capacitive input to the MOSFET lends itself to direct coupled circuitry, a savings in component count and circuit wiring. In addition, the MOSFET is even more stable with temperature than the JFET.

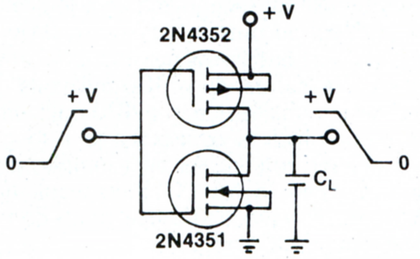


Figure 115. Complementary inverter circuit.

Several families of MOSFET logic have been proposed. For this discussion, attention will be centered on complementary logic (CMOS logic). The basic complementary inverter circuit is shown in Figure 115. This circuit has the unique attribute of dissipating almost no power in either stable state. Power is dissipated only during the switching interval.

Complementary NAND Gate

The complementary NAND gate is formed as shown in Figure 116. The p-channel devices are connected in parallel and the n-channel complements are connected in series. The truth table for the 3-input NAND gate also appears in Figure 116.

A	B	C	OUTPUT
0	0	0	+V
0	0	1	+V
0	1	0	+V
0	1	1	+V
1	0	0	+V
1	0	1	+V
1	1	0	+V
1	1	1	0

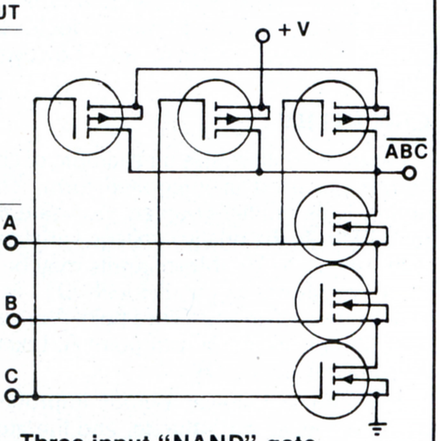
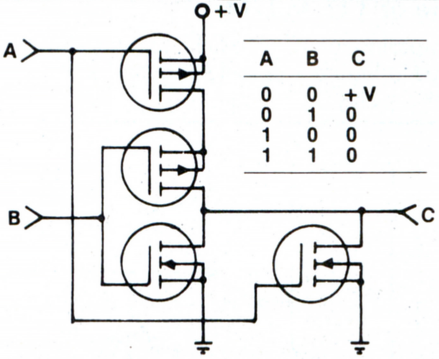


Figure 116. Three-input "NAND" gate.

For the NAND function, the output is always high, unless all three inputs are high. If any one or any pair of inputs are high, one or more of the p-channel MOSFETs will be held ON by the remaining low inputs, and the common output bus will be at +V. When all three inputs are high, all three parallel n-channels will be OFF and all three series n-channels will be ON, and the output is low.



A	B	C
0	0	+V
0	1	0
1	0	0
1	1	0

Figure 117. Complementary "NOR" gate.

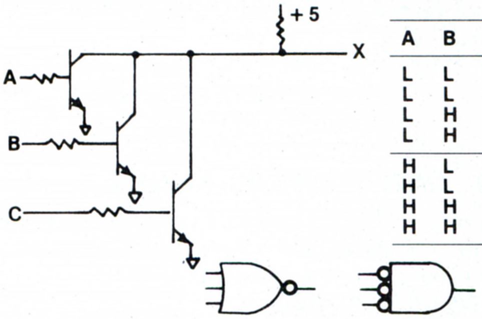
Complementary NOR Gate

The complementary NOR gate is shown in Figure 117. Here the order has simply been reversed. The p-channel devices are connected in series and then n-channels are in parallel. If any one of the inputs is high, one of the parallel n-channels will be ON, and the output will be low.

Only when both inputs are low will both series p-channels be ON, allowing the output to go high. Thus the conditions stated in the truth table (Figure 117) are satisfied. The same comments regarding the size of the NAND gate apply to the NOR gate.

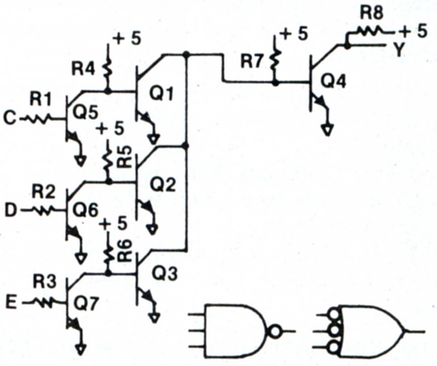
INTEGRATED INJECTION LOGIC (I^2L)

Integrated Injection Logic (shortened to IIL, or I^2L) offers higher densities and lower power dissipation than TTL or MOS technologies. I^2L operates somewhat differently to the



A	B	C	X
L	L	L	H
L	L	H	L
L	H	L	L
L	H	H	L
H	L	L	L
H	L	H	L
H	H	L	L
H	H	H	L

Figure 118. RTL "NOR" Gate.



C	D	E	Y
L	L	L	H
L	L	H	H
L	H	L	H
L	H	H	H
H	L	L	H
H	L	H	H
H	H	L	H
H	H	H	L

Figure 119. RTL "NAND" Gate.

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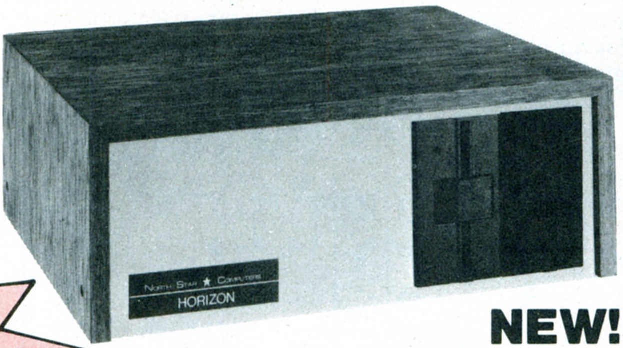

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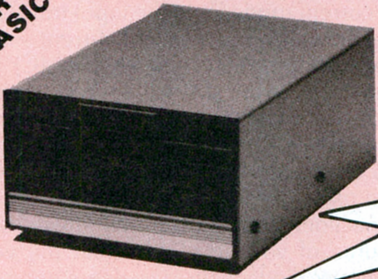

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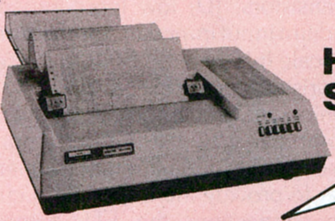

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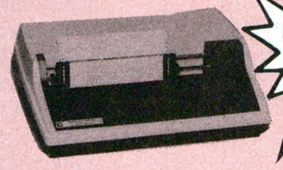

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CIRCLE INQUIRY NO. 71

ICs you have previously studied. To examine I^2L, let us first review RTL (Resistor-Transistor Logic).

Figure 118 shows a parallel transistors NOR gate configuration in RTL. Three inputs exist — A, B, and C — and a High on any input establishes base-emitter current to turn ON that transistor. Notice that if one or more of the transistors turned ON, output X goes Low.

To obtain an OR gate, it is necessary to only put an inverter in the output.

Making other gates using RTL is possible by adding inverters to the inputs and output.

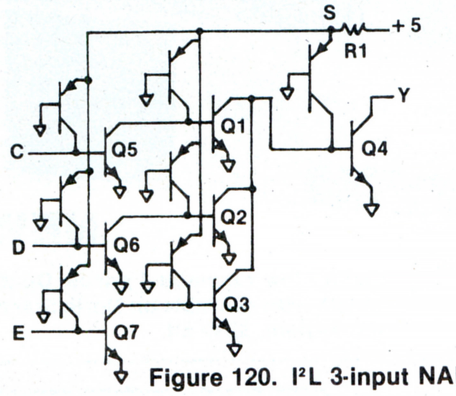

Figure 120. I^2L 3-input NAND gate.

I^2L Density

I^2L chips may contain as many as 3,000 gates operating at less than 10-nanosecond speeds, dissipating just 1 nanowatt of power per gate. Large-scale integrated (LSI) ICs are being used in electronic wristwatches and as single chip controllers for industrial, automobiles, and computer systems.

I^2L Advantages

Since I^2L is manufactured with today's TTL bipolar technology, it does not require major new technology research. The process is in production now. Because I^2L is made from a standard bipolar process, I^2L circuit designs can be made to interface with many other circuits.

I^2L Applications

In the digital area, applications include microprocessors of all varieties — from single chip, low-power, low-cost units to high-performance, bit-slice computer circuits. Next there are both very fast and not-so-fast 1,024-bit and 4,096-bit I^2L memories, plus watches, counters, timers, and all sorts of random control logic.

TRI-STATE LOGIC

Open collector logic has several disadvantages, among which are poor noise immunity, limited speed, and difficulty for servicing. To overcome these disadvantages, National Semiconductor developed the Tri-state TTL logic family.

Tri-state logic has turned out to be a very powerful tool for any application where many logic gates have to communicate to each other through a common "system bus," as in minicomputers and microcomputers.

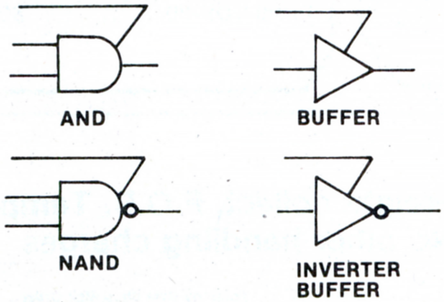

Figure 121. Symbols for individual tri-state AND, NAND, buffer and inverter buffer.

The logic may be called bus-oriented TTL, wire-OR-able TTL, or even bus-OR'-able logic. The logic uses a circuit that has three distinct output stages: the normal TTL levels of "0" and "1," and a third level, or state, in which the gate is "OFF"; that is, a state in which the gate has a high impedance (high-Z) and can neither sink nor source current at a definable logic level. In the OFF state, however, the gate has a certain amount of leakage that must be supplied by the other gates connected to the same output line.

In order to provide the high output current required by tri-state connections the TTL output contains a Darlington-connected upper stage.☐

NEXT MONTH

The August article will discuss microprocessors along with memories. RAMs and ROM will also be topics.

SUMMARY/QUIZ TUTORIAL #5

1. In the resistor logic circuit when the number of input circuits is large, the voltage: (A) is greatly reduced; (B) is greatly increased; (C) does not change; (D) is suddenly increased but then drops again; (E) will increase and decrease alternatively.
2. The forward resistance of a diode (A) is zero; (B) cannot be determined; (C) has an indefinite value; (D) has a definite value; (E) should not be taken into consideration.
3. In current mode logic the input transistor current: (A) is not drawn from a constant-current source; (B) is drawn from a variable-current source; (C) is drawn from a constant-current source; (D) can be drawn from a constant or a variable current source; (E) can be drawn alternatively from constant and variable current sources.
4. To obtain an "AND" circuit, or "AND gate," we (A) can use resistors; (B) cannot use diodes; (C) must use capacitors and diodes; (D) must use diodes and a source of voltage higher than the value of "1"; (E) must use diodes with a very low source of voltage.
5. When used in digital circuitry Field-Effect transistors have some definite advantages compared to (A) imposed transistors; (B) lower-priced transistors; (C) junction transistors; (D) low input-impedance transistors; (E) medium input impedance transistors.
6. Large-scale Integrated (LSI) ICs are being used in electronic wristwatches and as single chip controllers in (A) mechanical analog computers; (B) industrial, automobile and computer systems; (C) water pumps; (D) hunting guns' scopes; (E) TV automatic frequency controls.
7. In order to provide the high output current required by tri-state connections the TTL output contains (A) a transformer; (B) a back-up system; (C) heavy-duty components; (D) a Darlington-connected upper stage; (E) a Darlington-connected lower stage.
8. The Current Mode Logic (CML) circuits have the ability (A) to change logic levels by switching between two active current levels; (B) to leave logic levels unchanged when switching between two active current levels; (C) to change logic levels without having to switch between two active current levels; (D) to change logic levels by switching between two inactive current levels; (E) to change logic levels by switching between one inactive voltage level and one active voltage level.
9. As the various RTL families use transistors which are essentially identical, speed variations are primarily (A) the result of uniform resistance values; (B) unaffected by resistance values; (C) the result of different resistance values; (D) a result of the skill of the design engineer; (E) the result of the size of the digital circuit.
10. An example of a unipolar device is (A) junction transistor; (B) resistor; (C) capacitor; (D) MOSFET; (E) switch.
11. A technology that offers higher packaging densities and lower power dissipation than TTL or MOS technologies is: (A) RTL; (B) tri-state; (C) I^2L; (D) ECL; (E) DTL.

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MICROCOMPUTERS

TRS-80 Model II Announced

Radio Shack, manufacturer of the world-famous TRS-80 Microcomputer System, has introduced their all-new TRS-80 Model II, designed to meet the needs of many users for more data storage, greater versatility and higher computing speed.

The new computer has been primarily designed for the small business application market. It can perform as a general purpose data processing machine, an intelligent terminal, or a word processor. Software is immediately available for general ledger, accounts receivable, inventory control, mailing list management and payroll.

Price starts at $3450 for the 32K 1-disk system. For details contact Radio Shack, 1400 One Tandy Ctr., Ft. Worth, TX 76102.

CIRCLE INQUIRY NO. 121

MICROSTAR

MICROSTAR is a diskette-based system which is intended for many applications, including small business data systems, accounting, wordprocessing, order entry and inventory.

It features the STARDOS™ multi-user operating system with BASIC language support and UPDATE™, a database management system and report writer.

Complete small business system end user price is under $10,000. Delivery from stock to 30 days ARO. For details contact Micro V Corp., 17777 S.E. Main St., Irvine, CA 92714.

CIRCLE INQUIRY NO. 122

ATARI 800™

The Atari 800 is a top-of-the-line full color personal computer system. Its expandable memory, advanced peripheral components, comprehensive software library and modular design assure that it will never become obsolete.

This system features dual cartridge capability, user expandable random access memory up to 48,000 bytes, a series of optional peripheral devices including a high speed floppy disk for mass data storage and retrieval, and a 40-column printer utilizing standard paper.

Atari Inc., a division of Warner Communications Inc., plans delivery on both its new personal computer systems, the Atari 400 and the Atari 800 in August of this year.

For more information contact Jonas Halperin at (212) 484-8936 or write Atari Inc., P.O. Box 9027, Sunnyvale, CA 94086.

CIRCLE INQUIRY NO. 125

Home Computer Introduced by Texas Instruments

A home computer system has been announced by Texas Instruments Incorporated. The TI-99/4 operating with easy-to-use Solid-State Software™ command modules — serving as computer programs — provides a wide array of capabilities for any family member.

TI's home computer system consists of a console with 16K RAM, sound, graphics, a powerful extended BASIC and a 13-inch color monitor.

The TI-99/4 will be available in late summer through quality computer and electronics specialty stores in major U.S. cities. Suggested retail price is $1,150. Solid-State Software command modules are $19.95 to $69.95 suggested retail. For more information contact Texas Instruments, Inc., Consumer Relations, P.O. Box 53 (Attn: TI-99/4), Lubbock, TX 79408.

CIRCLE INQUIRY NO. 120

Findex Microcomputers

A unique line of general purpose microcomputers, combining the power of a central computer with the small size and portability of a terminal, are available from Findex, Inc.

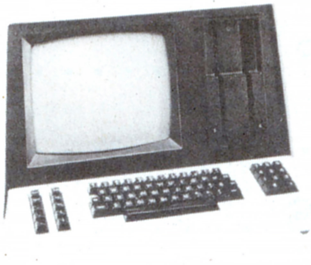
The major model, System 128, incorporates a unique 128k bytes magnetic bubble memory for mass storage, which can be expanded in increments of 128k. As an alternative to the bubble memory, Findex System 100 offers 90k bytes of mass storage in a mini-floppy disk.

The Findex systems are priced from less than $5,000. For details contact Findex, Inc., 1625 W. Olympic Blvd., #707, Los Angeles, CA 90015, (213) 7-FINDEX.

CIRCLE INQUIRY NO. 124

Low-Cost Small Business System

Designed for professional use, the SDS 420 small business microcomputer system is completely self-contained in a small desk-top cabinet. All subsystems are modular for simple servicing.



The SDS 420 employs an extended 12K BASIC interpreter, which provides all the features of standard BASIC plus commands for the input of strings with embedded terminators, sequential or keyed files, error handling and many others.

Single unit price is $7,700. Delivery 90 days ARO. For details contact Scientific Data Systems, 12640 Beatrice St., Los Angeles, CA 90066.

CIRCLE INQUIRY NO. 126

Desktop Computer Improved

Improvements have advanced the Hewlett-Packard System 45 Desktop Computer to a new, higher level of performance. They include an increase of more than seven times in maximum main memory, a reduction of more than 50% in the cost of adding memory, changes in the operating system to speed and simplify use, an increase in growth potential, new availability of nationalized keyboards and accommodation for new printer and disk options.

Prices start at $12,500. For details contact Hewlett-Packard Co., 1507 Page Mill Rd., Palo Alto, Ca 94304, Inquiries Manager.

CIRCLE INQUIRY NO. 127

64-Bit CPU

A new product line offered to System Builders by Functional Automation, Inc. features a 64-bit, 2 MIPS CPU (F6401) with simple and effective data handling features. The pipelined architecture includes three processors (instruction, address and data) that use microcoded bit-slice technology and operate in parallel. Instruction memory is RAM/ROM; there are sixteen 32-bit address registers and sixteen 64-bit accumulators.

The ¼ megabyte RAM data memory is byte addressable with variable word length so is logically a continuous byte string. Path width is 64-bits to the processing section and 32-bits externally to the system bus.

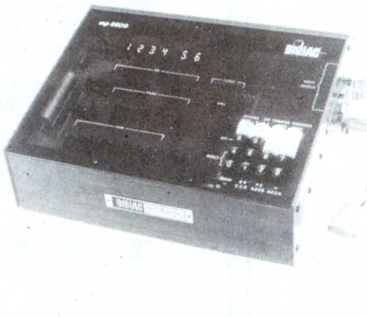
The F6401 was designed for a distributed system: multiple F6401s may be included in a system, and major I/O is handled by other specialized processors that are attached to the system.

Priced at $16,000 naked; power and packaging available. For more information contact Functional Automation Inc., One Executive Dr., Hudson, NH 03051.

CIRCLE INQUIRY NO. 128

Microcomputer Training System

The Model MP-6800 is a complete, ready-to-use, low cost, portable, Educational Microcomputer Training System built around the Motorola/Ami/Hitachi MC6800 microprocessor family. Self-contained for introductory instruction and more elaborate control projects without special training or expensive equipment.



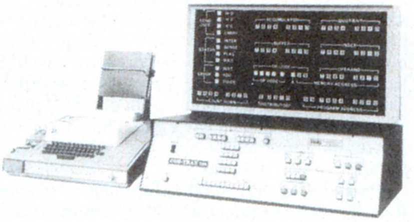
A keyboard and illuminated numeric display make the MP-6800 a convenient system for running small programs without expensive peripherals. The unit includes a complete detailed student manual covering microcomputer concepts, techniques and programming.

For details contact Digiac, 175 Engineers Rd., Smithtown, NY 11787, (516) 273-8600.

CIRCLE INQUIRY NO. 129

Desk-Top Computer Trainer

Com-Tran Ten motivates students with hands-on, true-to-life comptuer training. Simultaneous display of all registers, logical circuit layout and four position mode control operation brings computer science to a workable classroom level.



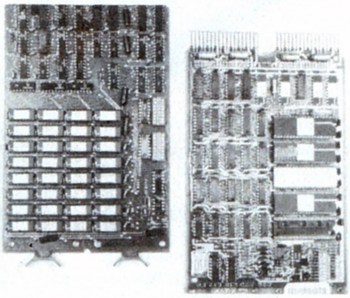
Students can examine the content of each register and learn their interrelationships. Com-Tran Ten's memory size and ability to interface with Digiac Electromechanical & Electrical training systems, plus many standard computer peripherals permit teaching of computer concepts, logic, design, data processing maintenance, programming and mathematics.

For details contact Digiac, 175 Engineers Rd., Smithtown, NY 11787, (516) 273-8600.

CIRCLE INQUIRY NO. 130

64K Byte Microcomputer System

A two-board microcomputer system utilizing Digital Equipment Corporation's LSI 11/2 central processing unit model KD11-HA with power fail/auto restart, 16-bit I/O DMA port, real-time clock input and Vector interrupt handling and Chrislin Industries' CI-1103 32K x 16 memory board is now available in single quantities. Memory is tested and burned-in.



Single quantity price is $1,250. Delivery is one week. For details contact John Ross, Chrislin Industries, Inc., 31312 Via Colinas, #102, Westlake Village, CA 91361, Computer Products Div.

CIRCLE INQUIRY NO. 132

Micro Programming Training Aid

The Instructor 50 is a low-cost microcomputer system about the size of a desk-top calculator. The Instructor-50, a training aid for microprocessor users, is completely self-contained, requiring no additional power supply, teletype keyboard, display terminal or other equipment.

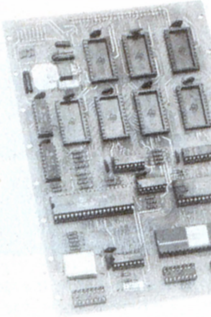
HELLO
The Instructor 50
The Instructor 50

Price is $350. Available from Signetics or its authorized dealers. For details contact Signetics, 811 E. Arques Ave., Sunnyvale, CA 94086, (408) 739-7700.

CIRCLE INQUIRY NO. 133

Building-Block Microcomputer

Expandable to 32K of RAM/ROM in any combinations, the Bedford MCS MicroComputer System features an 8080A-based single board computer that can be incrementally expanded in simple building-block fashion to provide only the functions required.



Expansion modules include parallel and serial adaptors, A/D and D/A converters, printers, keyboards, and displays.

Priced from $295. For more information contact Bedford Computer Systems, Inc., Three Preston Court, Bedford, MA 01730, (617) 275-0870, Roger Trudeau.

CIRCLE INQUIRY NO. 134

Portable Computer System

The MAScot is a complete computer system housed in a portable carrying case. The system contains the following modular components: 5" 7x9 dot matrix CRT, single or dual mini-floppy disk drives, 40 or 80 column dot matrix printer, 300 or 1200 baud modem and 8-bit or 16-bit microprocessor.

Quantity one prices range from $3,999 to $9,999. For more information contact Micro Application Systems, Inc., P.O. Box 12261, Minneapolis, MN 55412, (612) 871-9230.

CIRCLE INQUIRY NO. 135

Logging System

The MICROLOG Modular Microcomputer System is a fully implemented, 6800-based microcomputer system with integral low-level data acquisition capability. The system digital hardware, analog hardware, and software have been carefully integrated to provide the user with a general purpose measurement and control system that is simple and easy to use, yet powerful and flexible enough to meet the demands of laboratory and industrial environments.

The system is configured for a specific application by selecting the appropriate modules and plugging them into the mainframe. Because the analog modules provide signal-conditioning for most common sensors, the user simply plugs his sensors into the front panel.

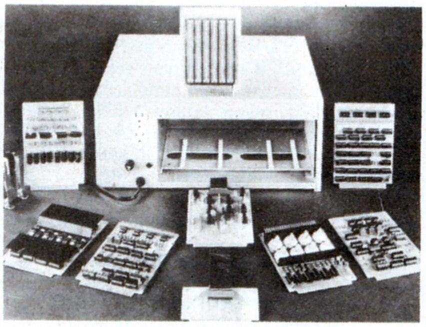
By providing a powerful, cost-effective solution to complex problems of data acquisition and control, the MICROLOG system gives a powerful new tool to the research laboratory: a general purpose measurement and control system.

Minimum price is $3,000. Delivery is stock to 120 days. For more information contact Microlog, Box 116, Guilford, CT 06437.

CIRCLE INQUIRY NO. 136

Data Acquisition and Process Control

The Real World Interface System is a low-cost, general purpose Data Acquisition and Process Control System, designed for use with mini and microcomputers. It features many different plug-in modules which give the user the flexibility and power to configure his system according to his needs.



The Real World Interface System has its own cabinet which includes a power supply, card cage and mother board with slots for up to 12 plug-ins.

Prices range from $65 in kit form to $360 assembled and tested. For more information contact General Computer Technology, 400 S. Lipan, Suite 2, Denver, CO 80223, (303) 722-5734, Michele Bielak, Representative.

CIRCLE INQUIRY NO. 137

Small Business Accounting System

OS-AMCAP is a disk-based small business accounting system which provides a full accounting bookkeeping system where larger systems are uneconomical.

As an easy to use, turnkey business system, OS-AMCAP is furnished on three 8" floppy disks, and maybe used on any Ohio Scientific 6502 based system with 48K of RAM and at least a dual-floppy capability.

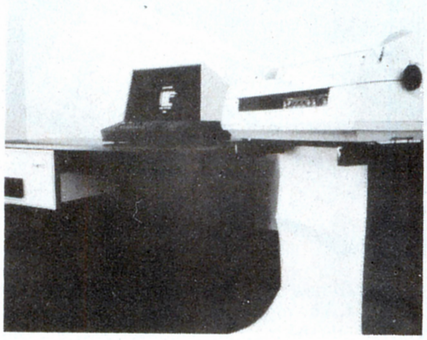
It also provides a comprehensive general ledger package and a billing/invoicing module. All modules are fully interactive through a common database, and provide easy-to-read reports.

Price is $975. For more information contact Ohio Scientific, c/o Sharp Advertising, Inc., 24500 Chagrin Blvd., Cleveland, OH 44122, (216) 464-3636, Nancy Valent.

CIRCLE INQUIRY NO. 138

Word Processing-Accounting System

With Infotecs' new, integrated IMP word processing-accounting system, users who need word processing cannot only store up to 550 pages of text on-line; select from among 20 easily changeable type fonts; print out correspondence of camera-ready quality in two colors at approximately one page per minute — they can also "talk" to the accounting data base.



The new word processing program interfaces with other programs currently available from Infotecs, both general accounting programs and specialized programs.

For details contact Infotecs c/o Eames Associates, 155 Baker St., Manchester, NH 03103, (603) 668-7900, Richard Rettig.

CIRCLE INQUIRY NO. 141

System 75

The System 75 features a programmable microprocessor with 52K bytes of RAM. Two or three diskette drives accept IBM media-compatible dual-sided diskettes, with 500,000 bytes storage capacity each. Total of 1.5M byte capacity.

Software includes ADDS*BASIC, ADDS*FORTRAN, Macro Assembler which are supported under the ADOS II operating system. Also provided with ADOS II is a complete set of utility programs, including a text editor and debug package.

The display terminal features a 12-inch diagonal non-glare screen, with a 24 line by 80 character per line format. A 25th line is reserved for terminal status messages.

For more information contact Applied Digital Data Systems Inc., 100 Marcus Blvd., Hauppauge, NY 11787.

CIRCLE INQUIRY NO. 140

Printer Plus Calcumeter Forms Data Logging System

Electro Scientific Industries continues to extend the utility of its microcomputer controlled multimeter — the Calcumeter 4100 — with the introduction of its new Data Logging Printer 4142.

Together the two compact instruments make up an inexpensive, wholly self-sufficient, and programmable data logging system for a wide range of applications.

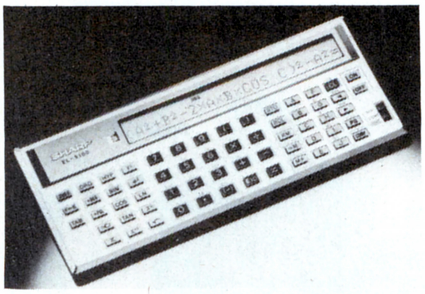
Printout is on ordinary adding machine tape, in formats up to 12 columns wide. The print roller is good for one million impressions before replacement is needed.

For additional information contact Electro Scientific Industries, 13900 N.W. Science Park Dr., Portland, OR 97229.

CIRCLE INQUIRY NO. 142

Scientific Calculators

Sharp Electronics has introduced two handheld scientific calculators in which alphanumeric formulas can be entered as written, without being translated into machine language.



The two new models are the EL-5100 and the EL-5101. The most complicated formulas can be entered into the machine and displayed, and can also be virtually edited, corrected, or tested without going through any translation phase.

Suggested retail prices are $99.95 for the EL-5100 which has a 24-character display, 61 keyed functions and memory safe guard; and $79.95 for the EL-5101 which has a 16-character display, six data memories and memory safe guard. For more information contact Sharp Electronics Corp., c/o Cunningham & Walsh Public Relations, 260 Madison Ave., New York, NY 10016, (212) 683-4900, Ed Falk.

CIRCLE INQUIRY NO. 143

EXEC I Computer

The EXEC I is a small desktop computer that features built-in dual floppy disk storage capacity in excess of 630K and is supplied with powerful software systems at no extra charge.

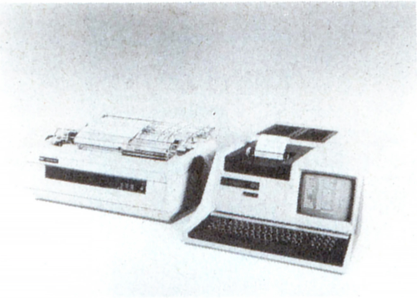
32K byte RAM is included in the base system as are RS232C compatible ports, for the operator's terminal and a printer. Aimed at the small business and system house market, the EXEC I is supported with specialized language packages including CP/M, FORTRAN, and COBOL.

OEM discounts available. Delivery is 30-45 days ARO. For more details contact Problem Solver Systems, 20834 Lassen St., Chatsworth, CA 91311, (213) 998-5100, Laurie Wing.

CIRCLE INQUIRY NO. 144

Finance and Insurance Computer

Auto dealers can substantially increase their Finance and Insurance (F & I) profits with a complete F&I computer available from Compucorp. This system is an inexpensive, yet powerful management tool, since it produces F&I Department and individual salesman profit and performance reports, in addition to all of the documentation that is normally required to close a deal.

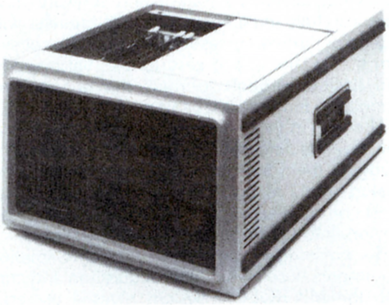


For more information contact Compucorp, 1901 S. Bundy Dr., Los Angeles, CA 90025, (213) 820-2503.

CIRCLE INQUIRY NO. 145

Multiple Microprocessor Development System

The AmSYS 8/8 Microcomputer Development System is especially designed to support the AmZ8000 16-bit microprocessor in both hardware and software. This system will also provide complete software support and an upward compatible path for the 8080, 8085 and Z80 8-bit microprocessors.



Price is $7,450. Delivery is 60 days ARO. For details contact Advanced Microcomputers, 3340 Scott Blvd., Santa Clara, CA 95051

CIRCLE INQUIRY NO. 146

Small Business System

Better Programming Systems has a complete small business development system based on the BPS data management system. Optional Payroll, General Ledger and Word Processing packages provide for Report Writer, Data Update and Data Query functions.

One megabyte mass storage, CRT with full-sized keyboard and 125 lpm, upper/lower case high-quality printer are standard. A typewriter quality printer, hard disk and other terminal specifications can be added to suit individual orders. The initial system can be upgraded to 300 megabytes with several data entry and retrieval stations. Thorough program documentation makes customization simple to do.

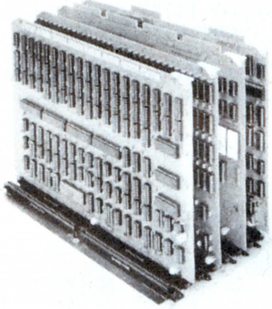
The BPS runs on an Ohio Scientific Challenger II or III microcomputer and is written in BASIC. For more information contact BPS, Inc., 322 W. 57th St., New York, NY 10019.

CIRCLE INQUIRY NO. 147

HEX-29

The HEX-29, priced like a microcomputer, is a true multitasking, multiuser, timeshare computer capable of supporting up to 32 users.

The powerful bipolar bit-slice processor includes 16 or 32 bit integer and 64-bit floating point operations, multi-byte/character string processing, transition table instructions and more.

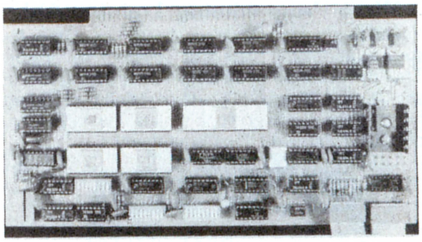


Priced from $14,950. Delivery is 60 days ARO. For details contact Digital Microsystems, 4448 Piedmont Ave., Oakland, CA 94611, (415) 658-8650, Steven Gant.

CIRCLE INQUIRY NO. 148

Slavemaster 2650 Multiprocessor

Two S-100 boards form Slave/Master multiprocessor system. Designed around the easy to program minicomputer like Signetics 2650 uP. One board may be used as a single 2650 system.



Possible multiprocessor applications include real-time control, simulations, foreground/background, front end pre-processing, development system. Possible single applications include general data processing, black-box control applications such as energy management, automation controls, test instruments.

Price is $189 kit, $269 assembled. Signetics PIPBUG monitor on 2708 is $25; Signetics Little Assembler on 2708 is $25. For more information contact Victoria Micro Digital, 401 Dundee St., Victoria, TX 77901.

CIRCLE INQUIRY NO. 149

Data Entry Keyboard Skill Building

The Keytrainer System is an audio/visual system developed specifically to build or improve alphanumeric keyboard skills on virtually every type of computer or word processing keyboard.

Keytrainer makes very little demand on the supervisor's time. Using an easy to operate sight/sound unit, headphones and an exercise manual, staff members can train themselves.

For more information contact Advanced Systems, Inc., 1601 Tonne Rd., Elk Grove Village, IL 60007, (312) 593-1790, John DeAno.

CIRCLE INQUIRY NO. 150

IC Test System

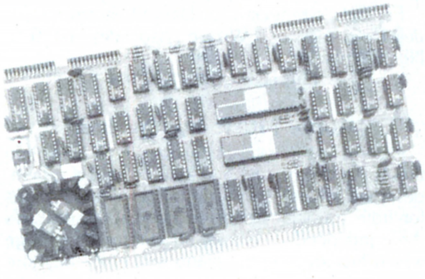
The Imperial Technology IT200 integrated circuit testing system includes a highly versatile computer-controlled editor. It allows programs to be generated or changed easily and quickly in a conversational English language.

The test portion of this system accommodates virtually all digital IC types and has a 48-pin capacity. For more information contact Imperial Technology, 831 S. Douglas St., El Segundo, CA 90245, (213) 679-9501, Roy Norman.

CIRCLE INQUIRY NO. 151

4 MHz Single Card Computer

Cromemco's Single Card Computer is a complete computer which brings the power of the Z-80 and the flexibility of the S-100 bus to the dedicated computer environment.



Only a power supply and PROM software are required for operation. The Single Card Computer is compatible with all Cromemco cards.

The Single Card can also be the core of an expandable S-100 bus system that can include additional memory, I/O, or even floppy disk drives as required.

Price is $395 for kit, $450 assembled and tested. For more information contact Cromemco, Inc., 280 Bernardo Ave., Mountain View, CA 94040, (415) 964-7400.

CIRCLE INQUIRY NO. 152

Color Graphics Management System

The Model CG1399M is a new system that enables users to draw original artwork or trace drawings in significantly less time than other conventional techniques.

Drawings made through the system are duplicated on a 13" color CRT screen. Automatic fill routines in the software make coloring large areas and utilizing different patterns as simple as a few keystrokes on the accompanying keyboard.

Base price is $21,995. For details contact Chromatics, Inc., 3923 Oakcliff Industrial Court, Atlanta, GA 30340, (404) 447-8797, Don McKinney, Marketing Manager.

CIRCLE INQUIRY NO. 153

Industrial Micro Enhancements

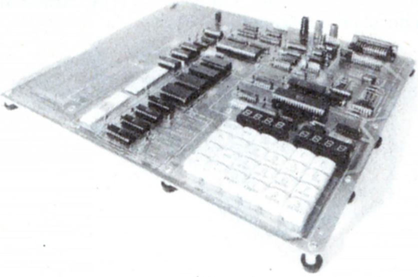
Technico Incorporated introduces several new modules to further expand its 16-bit industrial microcomputer product line. Along with the 9900 based 16-bit CPU module, there now exists 7 additional application support products including 16K and 32K byte static memory modules, 16K or 32K byte EPROM memory modules, a new 10-bit A/D-D/A module, 128-bit bi-directional I/O module, multi-functional I/O module, video module, 6K bytes of RAM, cassette interface, CRT expansion edge card connector, and several special function CRU control bits.

For details contact Technico, 9051 Red Branch Rd., Columbia, MD 21045, (301) 596-4100.

CIRCLE INQUIRY NO. 154

Microcomputer Kit with 8086 CPU

The SDK-86 is a complete 8086 microcomputer system on a board with memory and I/O systems in kit form. This stand-alone 16-bit microcomputer allows designers hands-on experience with Intel's 8086 16-bit HMOS microprocessor.

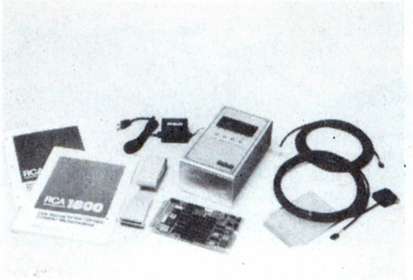


The kit includes an 8-digit LED display, a 24-key keyboard and all other necessary components. Price is $780. For more information contact Intel Corp., 3065 Bowers Ave., Santa Clara, CA 95051, (408) 987-8080, Mike Peak.

CIRCLE INQUIRY NO. 155

Microboard Prototyping System

Custom microcomputer design and application development are considerably facilitated by the new Microboard Prototyping System, CDP18S691, based on the new line of Microboard Milliwatt Computer Systems available from RCA Solid State Division.



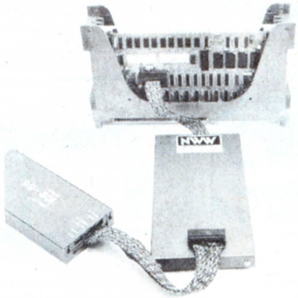
This fully assembled prototyping system speeds up and simplifies microcomputer design by providing the key ingredients in a very flexible format, thus enabling the user to get off to a fast start with software design and application evaluation.

Price is $990. For details contact RCA/Solid State Div., Route 202, Somerville, NJ 08876.

CIRCLE INQUIRY NO. 156

Emulator/Converter for 8080 Systems

Owners of Intel's Ice 85 Emulator and others can now emulate 8080 systems with MWW Micro Systems new 85/80 Emulator/Converter.



The converter is simple and easy to use. All of the Ice 85 features are retained including the 18 channel trace module making this a powerful emulator system for 8080 systems.

Price is $595. Delivery is stock to 3 weeks. For details contact Steve Weisbrod, MWW Micro Systems, Inc., 6805 Dakota Trail, Minneapolis, MN 55435, (612) 546-3690.

CIRCLE INQUIRY NO. 157

Business Micro

The SEKTOR 4, a true business micro, is housed in a heavy duty industrial cabinet. Dual 8-inch drives provide over one million characters of storage on flexible diskettes. An S-100 bus card allows the Sektor 4 to grow from a small unit to a hard disk, multi-tasking, multi-user system.

Sektor software includes an ultra-fast keyed operating system. Specially developed software packages are available for accounting and medical billing applications. Programs are in BASIC.

For details contact Computer Components, Inc. of Orange County, 6791 Westminster Ave., Westminster, CA 92683, (714) 891-2584.

CIRCLE INQUIRY NO. 158

Multi-User Small Business Computer

A new multi-user small business computer system designed for large-scale programming in BASIC and COBOL comes in two models, designated the 1000/4 and 1000/8 Data Systems.

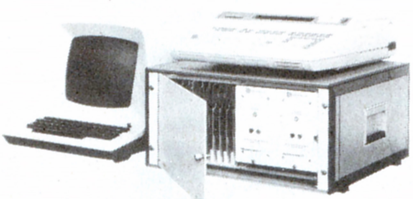
The two models consist of a 16-bit CPU, 32K-64K 16-bit words of dynamic RAM, four or eight ADM-3A Dumb^{TM} terminal consoles, respectively, a bi-directional 180 cps Ballistic^{TM} printer, and a 10 megabyte cartridge disk memory.

For details contact Lear Siegler, Inc./Data Products Div., 714 N. Brookhurst St., Anaheim, CA 92803, (800) 854-3805; in California (714) 774-1010.

CIRCLE INQUIRY NO. 159

Measurement and Control System

The CYBER I Measurement and Control System is completely IEEE-488 compatible and has been designed to interface with most popular desk top calculators.



The basic system includes a chassis, power supply and a variety of signal conditioning cards. It is available in both a rack mountable or desk top configuration.

Prices start at $7,700. Delivery is 45 days ARO. For details contact Cyber Systems, Inc., 2031 E. Cerritos Ave., Anaheim, CA 92806, (714) 772-2051, Dave Howard.

CIRCLE INQUIRY NO. 160

Project Control Computer

TRAKMASTER is a project control computer based upon the Alpha Micro AM-100 with a 10 megabyte subsystem to configure a turnkey desk station with CRT and 132 column printer.

CTCS (Contract Task Control System) is ON-TRAK's proprietary project forecasting and monitoring software for the TRAKMASTER computer. CTCS aids cost proposal preparations and monitors real project expenditures down to the task level.

CTCS features include user defined WBS (work breakdown structure) logically groups all tasks; project team identified tasks are forecast for monthly man-hour amounts. Non-labor tasks are forecast in dollar initially; real expenditures are monitored by task for comparison with forecasts; reports include forecast-only, real vs. forecast, and C/SSR (Cost/Schedule Status Report). Subtotals by WBS category are available, as are reports for predefined task sets.

CTCS employs highly sophisticated screen layouts, and is entirely user oriented. Documentation includes the CTCS User's Guide and the CTCS Project Planning Guide.

For details contact On-Track, 961 N. Azusa Ave., #8, Covina, CA 91722, (213) 332-8113.

CIRCLE INQUIRY NO. 161

Business Systems for First-Timers

An information processing system that combines advanced microcomputing technology with the low cost and simplicity required by first-time, small-business users is available from Rexon Business Machines Corporation.

The Rexon Multi-Terminal Systems (RTS) models RX10 and RX30 are based on a high-speed 16-bit microcomputer especially tailored to run high-level language business programs that can serve non-computer-oriented personnel.

Prices start at $16,200. For details contact Rexon c/o Le Ance & Co., Inc., 1600 Dove St., #420, Newport Beach, CA 92660, (714) 752-1911, Michael Cashman.

CIRCLE INQUIRY NO. 162

System 410

The System 410 is a multi-terminal, programmable business computer that offers users low-cost disk storage and increased system memory. The base configuration consists of 40K bytes of system memory, a high speed 14-megabyte disk storage system, a video display terminal, and a bi-directional printer.

The System 410 is designed for companies making the transition from manual accounting methods to computers as well as for more specialized data processing applications. Minimum price is $32,500. Delivery is 120 days. For details contact Basic/Four Corp., P.O. Box C-11921, Santa Ana, CA 92711, (714) 731-5100.

CIRCLE INQUIRY NO. 163

PERIPHERALS

Compact Data Card Reader

The MR-500 mark sense card reader is a simple, low-cost alternative to keyboard data entry that is ideal for a wide range of small business and education applications.

MARK READER
CHATSWORTH DATA

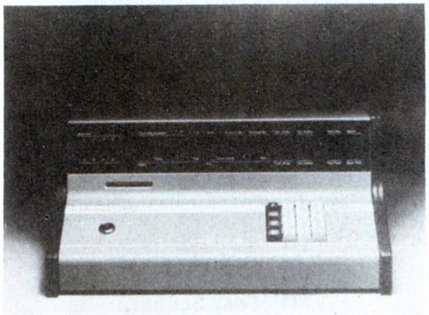
The new reader acepts cards of any length marked with a standard number two pencil. The card is hand-fed into the unit which turns on automatically and converts data into either ASCII or card image.

Single unit price, including interface, is $895. Delivery is 90 days. For details contact Frank Lefkowitz, Mktg. Dept., Chatsworth Data Corp., 20710 Lassen St., Chatsworth, CA 91311, (213) 341-9200.

CIRCLE INQUIRY NO. 164

Cardkey Security

The Interrogator 790 is a maximum security central control access system which is completely interchangeable with alarm monitors, card readers and other system peripherals designed for Cardkey's large capacity Interrogator 880 system.



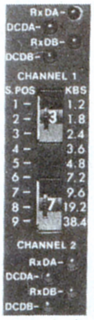
The Interrogator 90 is capable of controlling, monitoring and documenting the movement of up to 2500 individual card holders and provides dozens of levels of access coding.

For details contact Cardkey Systems, a division of Greer Hydraulics, a VSI company, 20339 Nordhoff St., Chatsworth, CA 91311.

CIRCLE INQUIRY NO. 165

Data Switching

Gandalf Data has a fully electronic data switching system (Front End Switch) capable of connecting a number of asynchronous terminals to any of several sources of computing service. System switching is controlled by the DTR signal(s) of the connected service and switching to a backup system occurs automatically when DTR goes false on the primary system.



For details request FES Data Sheet from Gandalf Data, Inc., c/o Wizard Associates, 1019 S. Noel, Wheeling, IL 60090.

CIRCLE INQUIRY NO. 166

Apple Music Synthesizer

A complete music synthesizer which plugs into the Apple II computer and a home stereo system, designed for use in a wide range of applications for both musicians and recreational use features three independent voices, an eight octave range which includes the full piano range, 24 or more notes per octave, accurate tuning, and volume/envelope control.

The synthesizer has abundant software ranging from simple driving routines to an innovative interactive-graphics music entry system. Five sample songs are included on the software cassette. The unit is assembled and tested with an extensive owner's manual, software cassette, circuit card, and audio output cable.

Suggested price is $265. For more information contact ALF Products Inc., 128 S. Taft, Denver, CO 80228.

CIRCLE INQUIRY NO. 167

Apple II Light Pen

A low cost light pen is now available for simple installation and immediate operation in applications such as bar graphs, charts, and games. The Apple II Light Pen is supplied with three demonstration programs on cassette.

The Pointer software driver performs seven functions which include selection of graphics mode and page two display, search for X and Y ordinates, a test for odd/even Y ordinate, set page one display,and return to calling program.

Price is $34.95. For details contact Programma International, Inc., 3400 Wilshire Blvd., Los Angeles, CA 90010, (213) 384-0579.

CIRCLE INQUIRY NO. 168

PECKER-I

Using an 8-bit Z-80 microprocessor and 16K bytes of RAM, Toyo Telesonics Co., Ltd., has developed a powerful, yet portable EPROM programmer which features low cost and high performance.

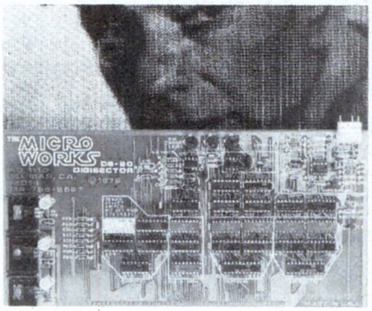
The PECKER-I has multiple functions including various editing functions through the RAM buffer and execution commands, in addition to its simple programming functions.

Basic unit price is $1,440. For details contact Intertek, Inc., 7-2-8, Nishi-Shinjuku, Shinjuku-Ku, Tokyo, Japan 160, Tel. 03-369-6649.

CIRCLE INQUIRY NO. 169

DS-80 Digisector®

The Micro Works Digisector is a random access video digitizer which provides such exclusive features as a high resolution 256x256 picture element scan, 64 levels of gray scale, and conversion times as low as 4 microseconds per pixel.



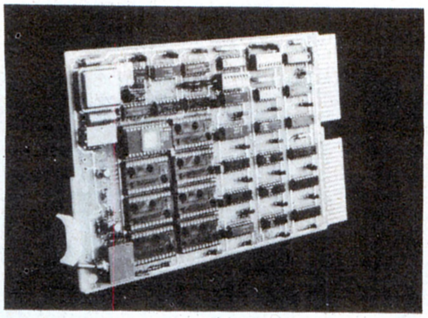
The unit uses 1 bus slot on any S-100 system conforming to IEEE standards. Software included has routines to drive both graphic and ASCII printers.

Price is $349.95 assembled and tested. For details contact The Micro Works, P.O. Box 1110, Del Mar, CA 92014, (714) 756-2687.

CIRCLE INQUIRY NO. 170

EPROM Module and Programmer

An LSI-11 8K EPROM module and Intel-2716 type EPROM programmer is available from Control Logic as a plug-in board designated model CCS-1220.



Under software control it provides programming of any memory location either individually, sequentially or at random.

Single unit price is $450 including User's Manual. Delivery is 30 days ARO. For details contact Control Logic, Inc., 9 Tech Cir., Natick, MA 01760, Hirem French, Natl. Sales Mgr.

CIRCLE INQUIRY NO. 171

Kansas City I/O

The Mykro K.C. I/O interfaces a computer's serial data to and from an audio tape recorder and uses the Kansas City standard audio frequencies and data rate of 300 baud. The input portion also reads 1200 baud recordings made with the separate modulator of the Mykro Tape Operating System MYTOS.

K C I/O by Mykro

Price is $95 assembled and tested with Owner's Manual. S-100 board version of MYTOS available in August. For details contact Mykro Corp., P.O. Box 61644, Sunnyvale, CA 94088, (408) 733-8221.

CIRCLE INQUIRY NO. 172

Light Sensor

The HEDS-1000 is a high resolution, high speed reflective sensor using an LED emitter, photo IC detector and precision optics. The device is designed to scan color bar codes and will find application in optical inspection, facsimile sensing, pattern recognition, edge sensing and tachometry.

30656 56060

The HEDS-1000 operates from a single 3.5V to 20V power supply. It has a bipolar photo IC detector which allows simplified interface electronics.

Price is $18.50 in 100s. For details contact Hewlett-Packard Co., 1507 Page Mill Rd., Palo Alto, CA 94304, Inquiries Manager.

CIRCLE INQUIRY NO. 173

S-100 Bus TIME/DATE Board

The T-102 is a digital CLOCK/CALENDAR board for the S-100 bus which features time of day in hours, minutes, seconds; 24-hour time format; month and day date functions; on-board crystal controlled time base; simple to use latched BCD interface; easy interface to BASIC or other languages

Fast set, slow set, and register reset functions allow rapid setting of time and date. The board also features low battery drain in backup mode, will run with 4MHz processors, and can be located at any group of 4 I/O port addresses. There is an optional battery backup capability of 8 to 18 volts.

Output is in BCD and each selected digit is latched until read. This allows the use of most BASICs. Timing is not a critical factor.

Price is $99.95 assembled and tested with user's manual. For details contact Compu/Time, P.O. Box 5343, Huntington Beach, CA 92646, (714) 536-5000.

CIRCLE INQUIRY NO. 174

TRS-80 Voice Synthesizer

The TRS-80 Voice Synthesizer is an accessory for Radio Shack's TRS-80 microcomputer system. It translates the computer's output into recognizable, intelligible speech.

Radio Shack
TRS-80
VOICE SYNTHESIZER

The synthesizer includes a volume control, built-in speaker and cable assembly that permits easy plug-in connection to TRS-80 systems.

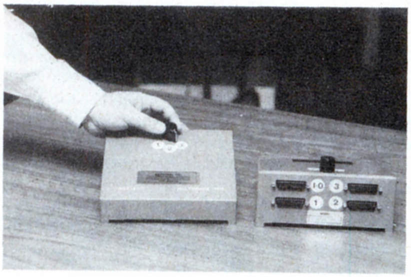
Programming is done in BASIC. About 60 "phonemes," representing units of speech, can be entered via the computer keyboard.

Price is $399 with instruction manual and demonstration cassette. For details contact Radio Shack, 1300 One Tandy Ctr., Ft. Worth, TX 76102, H.L. Siegel, Natl. Publicity Mgr.

CIRCLE INQUIRY NO. 175

RS232 Peripheral User

The RS 232-X family of low cost miniature switching units allow connection of peripherals, modems, CRTs in any conceivable configuration. After the configuration is established, by a turn of a switch, various peripherals can be selected or diselected.



The RS 232-X family consists of five models. The RS 232-X3 can selectively connect your printer, CRT, modem, etc., to the main driving device (mini, micro or main CPU).

Price for the 232-X3K (kit version) is $47.95; $64.95 assembled and tested. For more information contact Giltronix Inc., 3156 Avalon St., Palo Alto, CA 94306, (415) 493-2199.

CIRCLE INQUIRY NO. 176

Micro-Based Cassette Terminal

The MFE 5450VRL Microprocessor Cassette Terminal is an NCR-compatible, microprocessor-based cassette terminal for applications including data communications, data logging and program loading.

The MFE 5450VRL is an 8080-based memory storage system that features an optional variable record length read capability for compatibility with NCR's variable block length systems.

Prices start at $1995 each. For details contact MFE Corporation, Keewaydin Dr., Salem, NH 03079, (603) 893-1921, Jim Saret, Prod. Mgr.

CIRCLE INQUIRY NO. 178

Teletype Model 40 Printer Interface

It is now possible to control a Teletype Model 40 printer from an Imsai SIO board, with complete control of all the Teletype control signals, and at speeds up to 9600 baud.

This package monitors all the alarm and status signals on the TTY 40. A flowchart and source listing of the software driver is provided for easy implementation. Also provided is a diagram showing the EIA cable connections, and the SIO jumpers needed. No modification to the TTY 40 is necessary.

Price is $99.95. For more information contact Starr Computer Systems, 8010 Hascall St., Omaha, NE 68124, (402) 393-2837.

CIRCLE INQUIRY NO. 179

6500 Based PROM Programmer

The CSB 10, newest module in the Compas Single Board (CSB) family, is a programmer card for Intel 2758, 2716 and 2732 ultra-violet erasable memories or compatible products from other manufacturers.

CSB 10 features a gold plated edge connector which adheres to the Rockwell System 65 bus standard. All required voltages are derived from the +5 volt supplied on the card edge connector. CSB 10 includes a zero insertion force socket for fool-proof EPROM insertion and removal.

Software is supplied for each version of CSB 10 on media appropriate to that device at no additional charge. Price for board and software is $150. For details contact Compas Microsystems, 224 S.E. 16th St., Ames, IA 50010, (515) 232-8187, Michael Corder.

CIRCLE INQUIRY NO. 177

The SMARTY

The SMARTY is a Universal PROM Programming system with a new concept — Permanently Connected Slaves — which eliminates the need for changing personality modules and pinout adapters. Single Unit Family, FPLA and Sweet Sixteen slaves are available for programming all types of PROMs.

The SMARTY SM-100 master unit includes a built-in 2708/04 programmer. The unique Family EPROM slave programs all the popular development type EPROMs including 2716(I), 2732(I), 2758(I), TMS 2716(TI), TMS 2516(TI) and TMS 2532(TI).

Price is $1,695 including the built-in 2708/04 Programmer, PROM Simulator and all features. Unit and Family Slaves are $275 to $450 each. Delivery is 30 days ARO. For details contact Sunrise Electronics, 307 S. Vermont Ave., Unit H, Glendora, CA 91740, (213) 963-8775, Al Jerabek.

CIRCLE INQUIRY NO. 183

Light Pen for PET 2001

A self-contained light pen which plugs directly into the Commodore PET 2001 user port makes it possible to bypass the PET's keyboard and interact directly with the information displayed on the CRT screen. The light pen adds versatility to most graphics programs and makes possible unique games.

POINT TO THE RECTANGLE
PET
personal computer

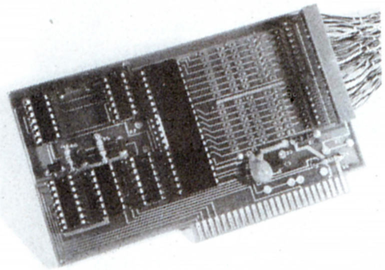
A menu can be displayed on the screen and a selection made from that menu by using the light pen. This type of interaction makes it easy for the non-computer oriented person to use an applications program.

Price assembled and tested is $29.95. For more information contact 3G Co., Inc., Rt. 3, Box 28A, Gaston, OR 97119, (503) 662-4492.

CIRCLE INQUIRY NO. 181

Data Acquisition for Apple II

The AI-02 Analog Input Card by Interactive Structures, Inc., provides a single card data acquisition system for Apple II computers. Sixteen analog channels may be monitored by the system with 8-bit resolution.



Channels are individually addressable and conversion time is 70 microseconds. The system can be operated easily from BASIC, and also provides interrupt capability for more efficient software implementation.

For more information contact Interactive Structures, Inc., Suite 204, 3401 Science Ctr., Philadelphia, PA 19104.

CIRCLE INQUIRY NO. 182

Tone Generator

The Telesis TONE/80 Programmable Tone Generator was designed for Radio Shack's TRS-80 Level II owners. The TONE/80 responds to output commands from the TRS-80 and can produce 128 different tones. The unit can be used to create sound effects for games, compose musical tunes or add sound to a burglar alarm.

The TONE/80 is shipped completely assembled, tested and guaranteed and requires no additional interfacing with the TRS-80. The unit is equipped with approximately 2' of ribbon cable with mating connector and can be plugged into either the TRS-80 keyboard module or the screen printer port on the expansion interface.

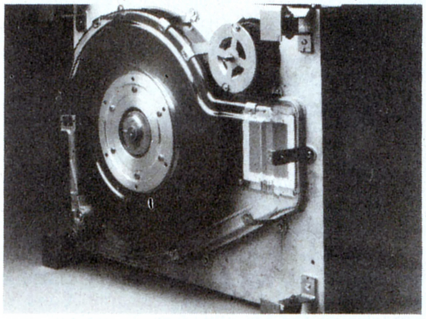
The TONE/80 includes a well-documented data and applications package that includes software for producing whistles, sirens, phasor sounds and even a few tunes. Also included are notes on how to add various sounds to computer games. Complete package price is $89.95. For details contact Telesis Laboratory, Peripherals Div., P.O. Box 1843, Chillicothe, OH 45601.

CIRCLE INQUIRY NO. 184

DISKS

Rigid Disk

The SA4000 fixed disk drives are available in 14.5 and 29 mbyte (unformatted) capacities with an optional 144 kbytes of additional head-per-track storage and are compatible with IBM S/32, S/34, and Series 1 architecture.



The drives utilize industry-proven Winchester read/write head and media technology. The drives are compact, mounting in a 19" RETMA rack and using only 5.25 inches of panel space.

For details contact Shugart, 435 Oakmead Pkwy., Sunnyvale, CA 94086, (408) 733-0100.

CIRCLE INQUIRY NO. 185

DM-85 Disk Mixer

The DM-85 Disk Mixer is an add-on board for the Smoke Signal Broadcasting BFD-68A Disk Controller which allows operation of both 8" and 5" drives. Controller mode (8" or 5") is selected on a drive-by-drive basis, so any mix of 5" and 8" drives is allowable.

The 2x3" PC board mounts inconspicuously on the back of the BFD-68A. Its operation is completely transparent to software.

Price for this kit is $39.95. For details contact The Micro Works, P.O. Box 1110, Del Mar, CA 92014, (714) 756-2687.

CIRCLE INQUIRY NO. 186

Microprocessor-Controlled Diskette Drives

The Model 288 is a new microprosessor-controlled diskette drive for the OEM marketplace which incorporates a dual-head design, lending itself to high yield manufacture.

The PerSci Model 288 is a dual-head, dual-density, dual-diskette drive. It reads and writes data on both sides of two diskettes in IBM compatible or expanded capacity single and double density formats.

Price is $925 in OEM quantities. Delivery is 60 days ARO. For details contact PerSci, Inc., 12210 Nebraska Ave., W. Los Angeles, CA 90025, (213) 820-3764.

CIRCLE INQUIRY NO. 187

Add-On Disk Drives for TRS-80

The MTI single-head disk drive family (TF-X) offers the user a choice of MPI, Pertec or Shugart SA4000 mini floppy disk drives. Shugart is the same device offered by Radio Shack, while Pertec provides quieter operation and the use of the Flippy diskette (uses both sides).

The MPI unit provides additional features normally found in the larger 8" disk drives such as door lock and automatic diskette ejection.

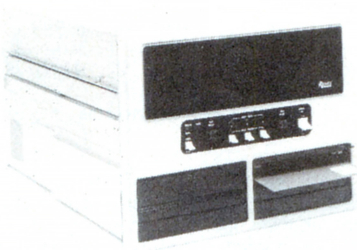
MTI's dual headed units (TDH-X) provide the same capacity as two single headed drives at a substantial savings in space and money.

Price of the TF-X single head units start at $379. Price of the TDH-X units is $675. All units include the disk drive, the power supply, and enclosure. For more information contact Microcomputer Technology, Inc., 2080 S. Grand Ave., Santa Ana, CA 92705, (714) 979-9923.

CIRCLE INQUIRY NO. 189

Disk System with Channel Command

The Remex Data Warehouse mass memory system is a new concept in high capacity/low cost disk systems, combining Winchester disk and flexible disk technology and utilizing channel communications techniques.



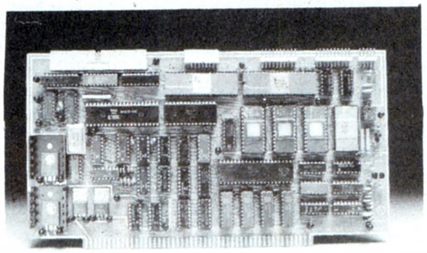
Designed for microcomputers and small to medium size minicomputers, the system incorporates a Winchester fixed disk drive with a storage capacity of 20 Mbytes and two Remex removable media flexible disk drives providing capacities up to 2 Mbytes.

Price is 6,592 in OEM quantities for a single density, single side diskette configuration. Delivery is 60 days ARO. For details contact Ex-Cell-O Corp., Remex Div., P.O. Box C-19533, Irvine, CA 92713, (714) 557-6860.

CIRCLE INQUIRY NO. 188

Disk Controller

The Teletek Floppy Disk Controller-I combines an intelligent floppy disk controller with the I/O normally required in a microcomputer system. It can be configured as the central processor in an S-100 system or as a smart floppy disk controller.



The disk operating systems available are CP/M, FAMOS and OASIS. It can read and write single or dual density drives in IBM 3740 or System 34 format.

For more information contact Teletek, 9767F Business Park Dr., Sacramento, CA 95827, (916) 361-1777.

CIRCLE INQUIRY NO. 190

10-Million Character Hard Disk Storage

Basic Time has a 10 million character hard disk computer system for the small business user. The system includes a single board CPU with 65k bytes of 800 nanosecond MOS memory.

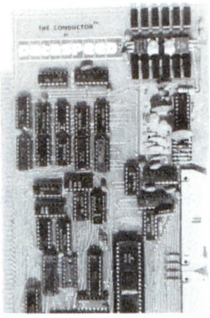
The disk is a top loading unit with one fixed disk and one removable disk, each of 5 million characters. The video display is a full 24 lines x 80 characters and ten-key keypad. The printer is a 150 cps bi-directional printer.

Complete system single unit price is $15,995. delivery is 30-60 days ARO. For details contact Basic Time, 1215 E. El Segundo Blvd., El Segundo, CA 90245, (213) 322-4435.

CIRCLE INQUIRY NO. 191

S-100 Compatible Disk Controller

The Conductor provides control of any combination of up to eight double and single density, double and single sided disk drives per system. The card incorporates a phase locked loop for superior speed tolerance and stability.



The board does not use a DMA interface, and is guaranteed to work with all memories including dynamics. The major portion of the logic is provided by the Western Digital WD1791 LSI controller chip.

Price is $295 assembled and tested. For details contact Dataspeed Inc., 1302 Noe St., San Francisco, CA 94131.

CIRCLE INQUIRY NO. 192

Hard Disk Interface for S-100 Bus

Validity Corporation's V-5000 series interface makes the hard disk available to the S-100 bus configured microprocessor system. It interfaces directly with a Datum controller to accommodate up to four disk drives of 10 megabytes each.

For more information contact Validity Corp., 1229 Morena Blvd., San Diego, CA 92110, (714) 275-1480, Daryl Nipper.

CIRCLE INQUIRY NO. 193

Quad Capacity Disk System

North Star Computers has available a quadruple capacity mini-disk drive for their Horizon computer which increases the Horizon's information storage capability to 360,000 bytes per 5¼" floppy disk. The quadruple capacity is also available on North Star's Micro Disk Systems.

The North Star disk controller is designed to accommodate the increased capacity, yet run existing programs with little or no change.

With one quad capacity disk drive and 32K of RAM the Horizon is priced at $2349. With two quad capacity disk drives and 32K of RAM the price is $2999. For more information contact North Star Computers, 2547 9th St., Berkeley, CA 94710, (415) 549-0858.

CIRCLE INQUIRY NO. 194

RS232 Mini Floppy Terminal

The MiniMate is a low cost RS232 compatible MiniFloppy Disk Storage and Edit Terminal designed as an attachment to intelligent CRT or hard copy terminals to handle store and forward applications effectively and efficiently.

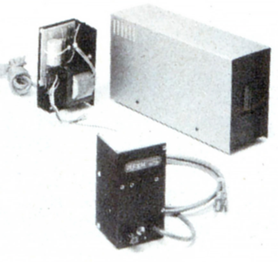
The MiniMate provides over 71,000 characters of working storage. It is capable of communicating with a host computer in either batch or interactive mode at speeds up to 9600 baud.

Single unit price is $1,295. For details contact Western Telematic Inc., 2435 S. Anne St., Santa Ana, CA 92704, (714) 979-0363, Mike Teague.

CIRCLE INQUIRY NO. 195

Mini-Disk Drive Power Supply and Enclosure

The PS-401 power supply was designed specifically to power the mini-disk drives used in Percom's LFD and TFD series of mini-disk storage systems.



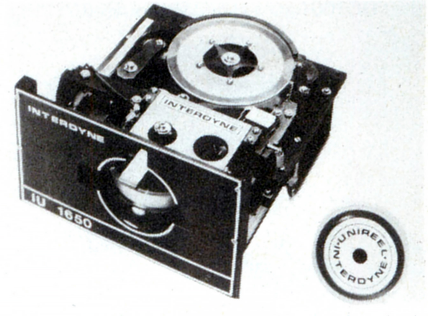
It comes complete wtih power cord and plug, dc connector, fuse and on/off switch. The predrilled 1-, 2- and 3-unit drive metal enclosures come in standard blue, silver or brown enamel finish. Other colors are optional.

Prices in 100s are $32.50 for PS-401 and $14.17 for 1-drive enclosure in standard color. For details contact Percom Data Co., 211 N. Kirby, Garland, TX 75042, (214) 272-3421.

CIRCLE INQUIRY NO. 196

Backup Tape Drive

The Model IU 1650 is a low cost magnetic tape unit for backing up non-removable hard disk drives. Storage capacity is 56 megabytes (unformatted) at 6400 BPI on 9 tracks with a transfer rate of 250 KBPS.



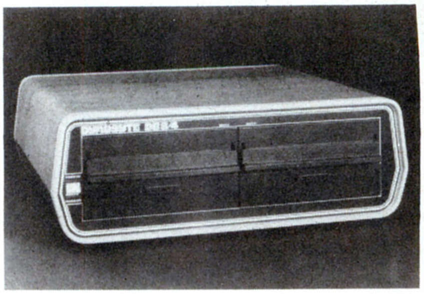
It reads and writes at 40 IPS and has high speed search. The single motor drive self-threads the tape and is a reliable tape handler. The Unireel tape package is a removable, self protecting, 650 ft. reel of ½" magnetic tape.

For details contact Interdyne Co., 14761 Califa St., Van Nuys, CA 91411, (213) 787-6800.

CIRCLE INQUIRY NO. 197

Double Density Floppy Controller

Dynabyte has a microcomputer system using its new disk controller that offers up to 512 Kbytes of floppy disk storage on each of 2 Shugart single-sided drives or 2 megabytes on 2 double-sided drives.



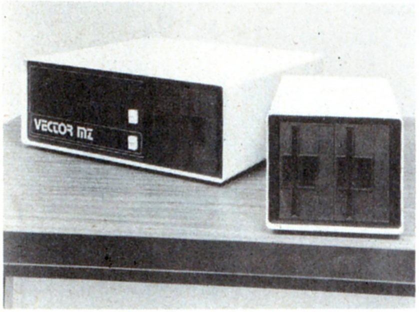
The disk controller is capable of handling a variety of 5-inch and 8-inch drives in dual density on either one or two sides.

For details contact Dynabyte Inc., 1005 Elwell Court, Palo Alto, CA 94303, (415) 965-1010.

CIRCLE INQUIRY NO. 198

MICRO-STOR™ Disk Module

MICRO-STOR is a 630,000 character dual floppy disk module used to expand Vector Graphic MZ and MEMORITE II systems from two disk drives to four.



MICRO-STOR features two Micropolis MOD II quad density disk drives using the standard 5.25-inch 16-sectored diskettes. The module simply plugs into the existing disk controller board.

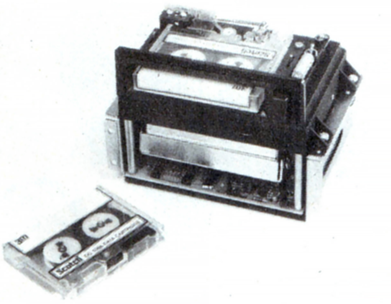
Price is $1395 assembled and tested. For more information contact Vector Graphic Inc., 31364 Via Colinas, Westlake Village, CA 91361, (213) 991-2302.

CIRCLE INQUIRY NO. 460

TAPE

3M Dual-Track Cartridge

The DCD-2 Data Cartridge Drive operates at a density of 3,200 frpi on two tracks, permitting a capacity of up to 672,000 8-bit bytes (using phase encoding recording, unformatted). Standard DC100A data cartridges are used.



The unit is marketed in a servo-only configuration for OEM incorporation in a wide variety of data-recording systems.

Price is about $320 in 100s. For details contact 3M, Dept. MN9-10, Box 33600, St. Paul, MN 55133.

CIRCLE INQUIRY NO. 199

OEM Streaming Tape Drive

Cipher's Low Profile Streaming Tape Drive is the first half-inch tape moving device configured specifically for disk backup in small business systems.

The drive is IBM and ANSI compatible, reading and writing data in 1600 bpi, phase encoded format on a 10½ inch reel of tape.

Price is $1,780 in OEM quantities. For details contact Cipher Data Products, 5630 Kearny Mesa Rd., San Diego, CA 92111.

CIRCLE INQUIRY NO. 200

Digital Cassette Tape Transport

The SEI Model 4240 4-track Digital Cassette Tape Transport is a high speed 1600 bpi cassette tape transport that features 30 IPS read/write and 60 IPS search speeds for fast data entry or retrieval; ceramic edge-referenced tape guidance to within .001 for proper data integrity; elimination of pinch rollers and capstan for greater reliability. Compact modular construction fits most systems.

Delivery is 30 days ARO. For details contact Saylor Electronics International, 1436 E. Katella Ave., Anaheim, CA 92805, (714) 634-4755.

CIRCLE INQUIRY NO. 201

Digital Cassette for Micros

A new MISCO digital cassette for microcomputers is designed as a replacement for audio tapes in units such as the TRS-80, Apple II, PET and Ohio Scientific.

The MISCO cassette gives consistent, long-lasting recording. 1600bpi tested, quality digital tape provides ten minutes of recording and is leaderless for instant play. Each cassette stores in a protective plastic storage box.

For more information contact Misco Inc., 963 Holmdel Rd., Box 399B, Holmdel, NJ 07733, (201) 946-3500.

CIRCLE INQUIRY NO. 202

NCR Cassette Reader

The Datacorder II can read and transmit data recorded on cassette by NCR cash register and terminal systems. Also cassettes recorded on the Datacorder are readable by NCR cassette readers.

Datacorder II is a microprocessor controlled key-to-cassette data entry terminal. Using IESI's high level formatting language, QUICK, data is key entered, edited and recorded on cassette, which can then be read by a host computer directly or via phone line.

Speeds to 9600 baud are available. The Datacorder can also be connected directly to other devices via its RS232 interface.

For more information contact International Entry Systems, Inc., 408 N.E. 72nd St., Seattle, WA 98115, (206) 525-6800, Dianne Consalvo.

CIRCLE INQUIRY NO. 203

TERMINALS

DEC VT-52 Emulation from Intertec

Intertec Data has upgraded its InterTube II Video Terminal to offer compatibility with the Digital Equipment Corporation VT-52 Video Terminal. VT-52 emulation is offered as a low cost option ($100) on all units.

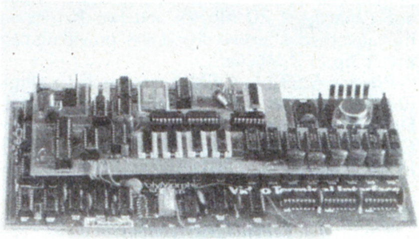
The InterTube also offers such standard features as an upper and lower case character set displayed on an 8x10 dot matrix; a full 25 line by 80 character screen; a full ASCII keyboard with an 18-key numeric pad and more.

OEM prices range from $598 to $895. For details contact Intertec Data Systems, 2300 Broad River Rd., Columbia, SC 29210, (803) 798-9100.

CIRCLE INQUIRY NO. 204

Graphics System

The POLYGRAFIX is a high density graphics system upgrade for the famous PolyMorphic VTI-64 video interface board. It is a piggy-back board which mounts directly onto the existing VTI-64 video boards and is still compatible with existing software.



The POLYGRAFIX allows the user to mix high resolution graphics with the standard character set in several modes of operation. The system is self-contained, does not require additional system memory and is compatible with the S-100 bus.

Prices start at $235. For details write V.A.M.P. Inc., P.O. Box 29315, Los Angeles, CA 90029, (213) 466-5533.

CIRCLE INQUIRY NO. 205

Multi-Terminal Display System

The ZFE-100 MTDS is a low cost Z80 based two P.C. card system for the S-100 bus. The ZFE-100 MTDS controls up to eight CRT terminals simultaneously. Hardware features include a Z80 microprocessor, 2-4K 2708/2716 EPROM, 4K dedicated 2114L RAM, 4K shared 2114L RAM, double buffering, eight synchronous/asynchronous terminal controllers with speeds from 110-9600 baud.

Software features include separate input-output buffering, auto echo, and a powerful recall editor.

Price is $1495. For details contact ZFE Systems, P.O. Box 28656, San Diego, CA 92127, (714) 485-7779.

CIRCLE INQUIRY NO. 206

ISC Announces Low-Cost High Resolution Capabilities

Intelligent Systems Corporation has announced low-cost high resolution capabilities for their Intecolor 8001G color graphic CRT terminals. Each character is comprised of 6x8 dot matrix, with all 48 dots addressable by software.

Intecolor high resolution graphics hardware consists of 512 software programmable characters. Random vectoring and symboling resolution is equal to 480 x 384.

The Intecolor 8001H operates in three main modes, eight foreground and background colors, with an 8080A microprocessor and a color and numeric keyboard. RS-232 interfacing capabilities plus 2K of ROM are standard.

All Intecolor terminals are covered by a six-month warranty. ISC guarantees delivery of a single evaluation unit for $3,000 on a cash in advance basis, within 30 days or money refunded.

For more information contact Intelligent Systems Corp., 5965 Peachtree Corners E., Norcross, GA 30071, (404) 449-5961.

CIRCLE INQUIRY NO. 207

Color Graphics System

The CGS-808 is a high quality, intelligent color graphics system for the S-100 bus. Based on the MC6847, the board provides featurs like an on-board microprocessor, up to 14K bytes of memory, graphics driver routines in firmware, 11 programmable modes with display densities ranging from 64x32 to 128x192 in 8 colors and 256x192 in 2 colors.

The CGS-808 can display alphanumerics and graphics simultaneously. There is a 42 character by 24 lines user programmable alphanumerics option available.

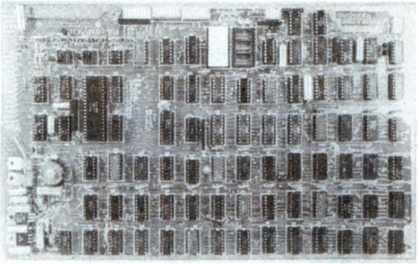
The CGS-808 uses 2 switch selectable I/O ports requiring no memory space and will run in any S-100 computer system.

Price is $385 assembled and tested, $99 for bare "kit" with the MOS chip set. For more information contact Biotech Electronics, P.O. Box 485, Ben Lomond, CA 95005, (408) 338-2686.

CIRCLE INQUIRY NO. 208

Dual Font 80x24 Terminal

The ESAT 200B is a full feature dual font (256 addressable characters) 'Glass Teletype' communicating terminal board designed and manufactured by Electrolabs. Either or both fonts may be programmed on a custom basis by the user to represent any desired characters or symbols into two 2708s or one 2716.



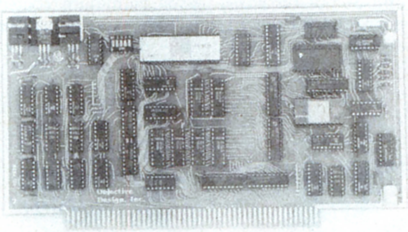
ESAT 200B features include non-destructive cursor; split-speed I/O baud rates (110 to 19,200 baud); RS-232 or current loop; full ASCII upper and lower case font supplied.

Price is $349 assembled and tested. For details contact Electrolabs, P.O. Box 6721, Stanford, CA 94305, (415) 321-5601.

CIRCLE INQUIRY NO. 209

Video Board Controls Screen Format by Software

Objective Design's new Video Display Interface (VDI) provides user control of screen presentations via software. This S-100 compatible card will create alphanumeric displays of 80x24, 64x16, 64x32 and many other formats.



Each individual character has reverse video and 4 levels of gray scale. Users can select via software a synchronized access mode which minimizes snow and other screen disturbances when entering data.

The VDI is designed for compatibility with the Programmable Character Generator to allow the creation of an infinite variety of screen presentations with super fine graphics up to 512x512.

Price is $379.95 assembled. For details contact Objective Design, Inc., P.O. Box 20325, Tallahassee, FL 32304, (904) 224-5545.

CIRCLE INQUIRY NO. 210

Compact CRT

Cybernex Limited has announced the availability of their 12" CRT computer terminals in a new, compact, molded enclosure. The enclosure has been designed to be attractive, rugged and functional. Finished in beige and bronze tones, these terminals will enhance any office decor.

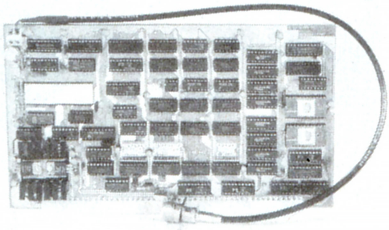
Seven standard models are available from low cost time sharing terminals to microprocessor controlled mutli page block mode and APL terminals.

For details contact Cybernex Limited, 2183 Dunwin Dr., Mississauga, Ontario, Canada L5L 1X2, (416) 828-2810, Bruce Douglas.

CIRCLE INQUIRY NO. 211

SS-50 Bus Video Board

Gimix Inc. announces its versatile 80x24 video board with hardware scrolling, x-y addressable cursor and multiple character generators for the SS-50 bus that allows user-defined programmable character sets.



It includes a TMS 2716 EPROM that contains a full 128 upper and lower case ASCII character set with true descenders; plus 2K of RAM for user-defined programmable character sets.

For details contact Gimix Inc., 1337 W. 37th Pl., Chicago, IL 60609, (312) 927-5510, Richard Don.

CIRCLE INQUIRY NO. 212

Desk Top Smart Terminal

The Model 10 desk top unit offers complete editing and formatting, wtih five field modifiers (including protect), 32 programmable functions (forms and control sequences), six transmission levels (character to full page), 16 programmable tabs, independently programmable I/O and peripheral speeds, monitor mode (control codes displayed) and cursor position read/write.

Standard model price is $1,290. Delivery is 6 weeks. For details contact Teleray, Div. of Research Inc., Box 24064, Minneapolis, MN 55424, (612) 941-3300, Richard Deegan.

CIRCLE INQUIRY NO. 213

Hazeltine 1420 Computer Terminal

The Hazeltine 1420 is a low-cost computer terminal designed to support small business systems using both data and word processing software. The terminal features a typewriter-style keyboard arrangement with both upper and lower case.

Hazeltine 1420

Among other important features included are cursor control keys, typematic, and as an option, remotely controlled auxiliary EIA output.

For more information contact Hazeltine Corp., c/o Irving L. Straus Associates, 655 3rd Ave., New York, NY 10017.

CIRCLE INQUIRY NO. 214

Interactive Video Display

The DASHER™ D3 is a combined interactive and buffered video display terminal which is compatible with, and offers greater function than the previous DASHER D1 and D2 models.

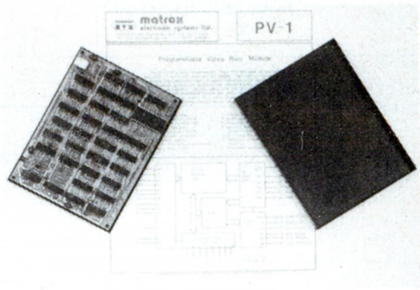
The display incorporates a separate sculptured typewriter-style keyboard and a pedestal-mounted, 12-inch monitor, as well as an industry-compatible asynchronous communications interface.

For more information contact Data General, Route 9, Westboro, MA 01581, (617) 366-8911, Roni Sarmanian, Ext. 4765.

CIRCLE INQUIRY NO. 215

PV-1

The Matrox PV-1 is a user programmable video RAM. Matrox Electronic Systems now makes available to users a CRT controller that is easily programmed to fulfill most non-standard display format requirements.



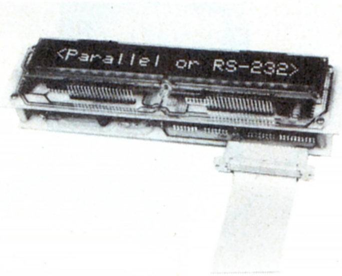
The PV-1 character font consists of 96 ASCII encoded alphanumeric characters with descenders and 32 graphics symbols. Either eight or sixteen lines of text containing from eight to 64 characters per line may be displayed.

Price is $295. Delivery from stock. For more information contact Matrox Electronic Systems Limited, 2795 Bates Rd., Montreal, Quebec, Canada H3S 1B5, (514) 481-6838.

CIRCLE INQUIRY NO. 216

Display Module

The DE/420 Intelligent Random Access Display Module includes on-board microprocessor. The DE/420 features vacuum fluorescent display technology of 20-characters/columns, 5x7 dot matrix with character generation of the full ASCII 96-character set.



Standard with the unit are a self test mode of all characters, automatic flashing of any or all characters, programmable cursor — blinking or invisible.

All character generation, display buffer, refresh and control logic are included in the package. Price is $250 in 100s. For details contact Digital Electronics Corp., 197 Airport Blvd., Burlingame, CA 94010, (415) 342-8333.

CIRCLE INQUIRY NO. 217

"Tubeless Terminals"

Synertek Systems has used advanced LSI design to implement all the digital logic of a smart terminal on a single PC board with full ASCII keyboard. There are three ways to get the standard Tubeless Terminals.

The KTM-2 Keyboard Terminal Module is the no-frills way to get smart terminal capability into a low cost computer system. The KTM-2/80 is an 80-column version of the KTM-2. The KT200 Tubeless Terminal is customizable.

Prices start at $349. For details contact Synertek Systems, 150 S. Wolfe Rd., Sunnyvale, CA 94086, (408) 988-5600.

CIRCLE INQUIRY NO. 218

PRINTERS

Forms Access Printer

Local Data has a new addition to their printer line — the Quiet 300 Forms Access Printer. This full-character unit features a Teletype model 40 print mechanism.

This 80-column tractor feed unit features a buffered-serial interface with a 1 to 4K memory with X-ON, X-OFF option. And it is Centronics or Dataproducts parallel plug compatible.

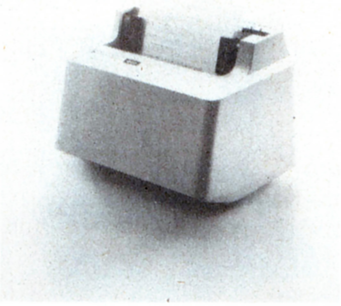
The heavy-duty, line-at-a-time, hard-copy impact printer prints crisply on up to six part forms. In addition, the Quiet 300 is capable of 300 lpm with ASCII 63 character set and 500 lpm with the 48 character set.

Price is $3910. For more information contact Local Data Inc., 2701 Toledo St., Suite 706, Torrance, CA 90503, (213) 320-7126, Richard Schmal.

CIRCLE INQUIRY NO. 219

Tractor-Feed Impact Printer

The Model 440 Paper Tiger™ is a highly versatile, low-cost impact printer that has software selectable character sizes, full upper and lower case 96-character ASCII set, plus 80 and 132 column formats.



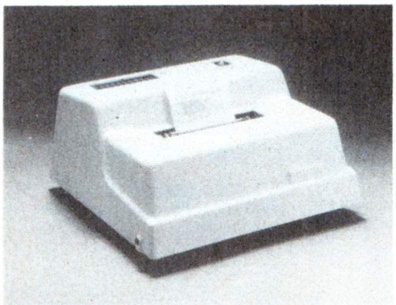
The Model 440 has a single PC board that contains all printer electronics and uses a field proven printhead rated at over 100 million characters.

Price is $995. For more information contact Integral Data Systems, Inc., 14 Tech Cir., Natick, MA 01760, (617) 237-7610.

CIRCLE INQUIRY NO. 220

IP-40

The MPI IP-40 impact printer features an IEEE-488 bus compatible interface. It operates in the "listen only" or the addressable "listen" mode of operation. A microprocessor controlled buffer allows a maximum closed loop transfer rate in excess of 7,000 characters per second.



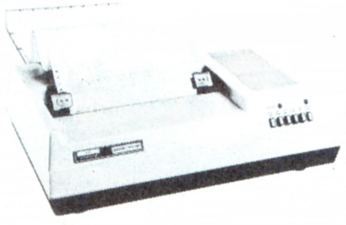
Characters are printed in a 5x7 dot matrix 64-character alphanumeric set, with an expanded 10x7 matrix available under software control.

Single unit price is $585. For details contact MPI, 2099 W. 2200 South, Salt Lake City, UT 84119, (801) 973-6053.

CIRCLE INQUIRY NO. 221

Heath Printer Available from MicroAge

The Heath WH-14 serial printer is now available from MicroAge Wholesale. The WH-14 combines speed, flexibility and ease of use with any computer providing standard RS232 interface connections.



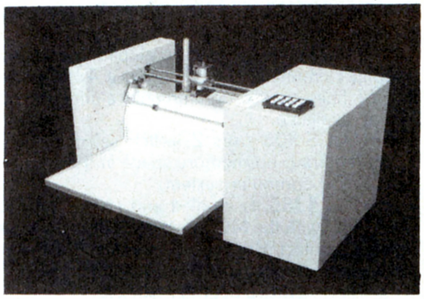
Its compact table top configuration allows convenient use with most systems. Interfacing for the Heath printer was developed by MicroAge.

For more information contact MicroAge Wholesale, 1425 W. 12th Pl., Tempe, AZ 85281, (602) 967-1421.

CIRCLE INQUIRY NO. 222

Plotter

The DRUM PLOTTER/RECORDER is unique in that the long or X axis paper is moved bi-directionally under the pen carriage at a maximum rate of 200 steps/second at .005" per step, and can continuously plot or record up to 144' using Z-fold or fan sprocket paper 11½" high (Y axis).



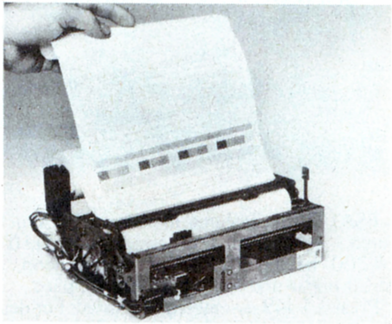
Parallel data entry is the standard interface and needs only five parallel lines to communicate. The command lines are 1. X Step; 2. Y Step; 3. X Direction; 4. Y Direction; 5. Pen Down.

Price is $1,600. For details write X and Y Enterprises, box 796, Huntsville, AL 35804.

CIRCLE INQUIRY NO. 223

Low-Cost Thermal Printer Mechanism

The T-80M is a dot-matrix thermal printer mechanism the includes the print head assembly, servomechanisms, and servoelectronics. Purchasers need only supply external TTL control signals and power.



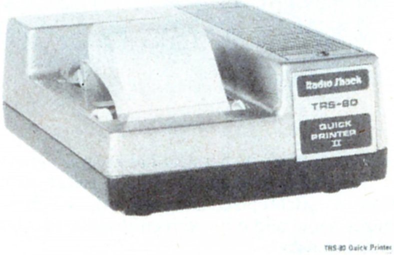
The T-80M has a speed of 80 characters per second and can be instructed to print characters in a 5x7 dot matrix or graphic with a 70-dot-per-inch horizontal and vertical resolution.

Single unit price is $890; $595 in 100s. For details contact Dataproducts Corp., 6219 De Soto Ave., Woodland Hills, CA 91364.

CIRCLE INQUIRY NO. 224

Radio Shack Printer

The Radio Shack TRS-80 Quick Printer II is an inexpensive printer that produces low-cost hardcopy output on a 2⅜" wide aluminum coated paper. Quick Printer prints both upper and lower case, double-size and double-spaced characters.



The printer is software selectable for 16 or 32 characters per line, and produces 120 lines per minute, 64 characters per second. Character set is a modified subset of ASCII, 96 characters, 5x7 dot matrix, 6 lines per inch vertical spacing.

Price is $219. For details contact Radio Shack, 1300 One Tandy Ctr., Ft. Worth, TX 76102.

CIRCLE INQUIRY NO. 225

Low-Cost Quiet Printer

The Model 912 is a non-impact printer that produces crisp, clean alphanumeric images in the full 96-character ASCII set, with upper and true lower case. The print medium is a unique 9x12 printhead matrix that generates overlapping dots to create more fully formed characters.

The Model 912 writes 80-column lines quietly at a speed of 225 cps on 8½" wide paper. IEEE-488 and strobe/acknowledge are supplied with the parallel-interface model; RS-232 and 20mA current loop are available on the serial-interface model.

For more information contact Computer Printers International, Inc., 280 Polaris St., Mountain View, CA 94043.

CIRCLE INQUIRY NO. 226

T-100 Printer/Plotter

The T-100 impact dot matrix plotter is a highly versatile, low-cost alternative to electrostatic printer/plotter technology. The T-100 accommodates forms from 4 to 16 inches wide and up to six parts.

Printing speed is 250 lpm with a standard 96-character set. Additional features include underlining, double high characters, either 6 or 8 lines per inch and lower case characters with descenders.

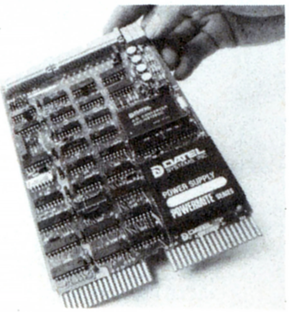
Price is $7230. For details contact Trilog, Inc., 16705 Hale Ave., Irvine, CA 92714, (714) 549-4079, Ray Melissa.

CIRCLE INQUIRY NO. 227

I/O BOARDS

Half-Quad A/D Board

The tiny SineTrac LSI-11/2 A/D I/O Board for the LSI-11/2 computer includes the interface controller, plus 16 A/D channels on one half-quad (8.5" x 5") board, plus a Programmable Gain Amplifier (X1,2,4,8 gains), the DC/DC Power Converter and an on-board Pacer Start Clock with 16 programmable timebases.

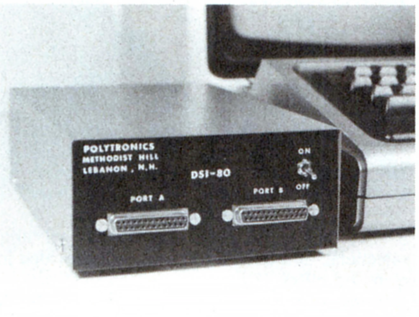


The ST-LS12 is powered from the +5V line available on the LSI-11/2. Price for standard ST-LS12 with 16S/8D A/D channels is $595 for one. For details contact Datel Systems, Inc., 1020 Turnpike St., Canton, MA 02021.

CIRCLE INQUIRY NO. 228

TRS-80 Interface

The DSI-80 is a dual serial interface for use with the TRS-80 microcomputer. The unit provides two serial output ports with both current loop and RS-232 interface. Jumper selectable speeds of 110, 150, 300, 600 and 1200 baud.



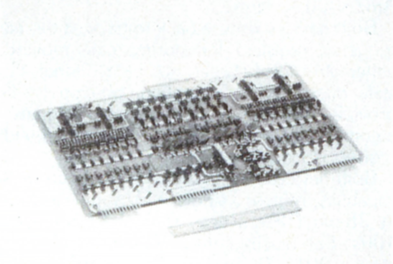
The timebase is crystal controlled, and the unit comes complete with manual, cassette tape and 6-month warranty.

For more information contact Polytronics, Methodist Hill, Lebanon, NH 03766.

CIRCLE INQUIRY NO. 229

Opto-Isolated I/O Card

The Controlsmith 24 Volt DC I/O Card is an opto-isolated card for interfacing microcomputers with industrial machine control environments.



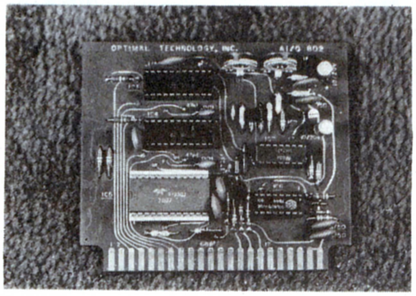
The card provides a standard 50-wire ribbon cable connection to Intel SBC and Natinal BLC I/O port connectors.

Price is $750. For details contact Controlsmith, Inc., 17 Airport Rd., Nashua, NH 03060, (603) 889-5986, Fred J.T. Dow.

CIRCLE INQUIRY NO. 230

8-Channel A/D & 2-Channel D/A

A new analog I/O card consisting of an 8-channel analog-to-digital converter and 2-channel latched D/A converter is available from Optimal Technology.



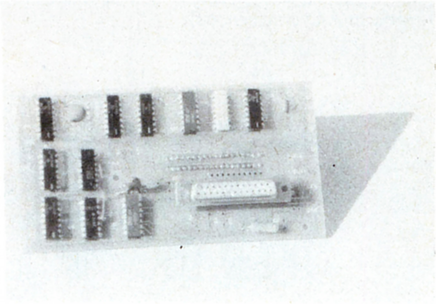
Both A/D and D/A are 8 bits with ±5V full scale analog inputs and outputs. Conversion time for A/D is 2 milliseconds and the D/A settling time is 2 microseconds.

Price is $115. For details contact Optimal Technology, Inc., Blue Wood 127, Earlysville, VA 22936.

CIRCLE INQUIRY NO. 231

Printer Interface Board for Okidata

International Electronic Equipment Corporation has designed a new interface board which greatly simplifies the interfacing of its low cost line printer with most popular types of computers.



The interface board allows direct connection of the high speed printer to the TRS-80 expansion interface printer port. The board can also be wired to other computers.

Price is $100. For details contact International Electronics Equipment Corp., P.O. Box 522542, Miami, FL 33152.

CIRCLE INQUIRY NO. 232

Teletype Model 40 Printer Interface

The Model SP-40 is a universal printer interface adapter for the Teletype Model 40 printer. This adapter interconnects the Teletype simplified EIA-like interface to a variety of serial and parallel computer and/or communication interfaces.

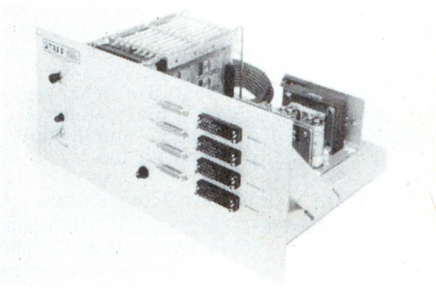
DIP-switch positions are used to select the required interface. The SP-40 is designed to mount inside the Local Data Quiet 300 acoustic enclosure or below the printer in the Teletype cabinet.

Price is $795. For details contact Local Data Co., 2741 Toledo St., Suite 214, Torrance, CA 90503, (213) 320-7126, Richard Schmal.

CIRCLE INQUIRY NO. 233

Programmable Interface Translator

Staff Computer Technology has introduced two new models of its 8085 microcomputer-based Series 400 Programmable Interface Translator.



The models 400-SEL and 400-FLEX were developed as a cost effective solution to the replacement of Selectric and Flexowriter output typers.

Options include ribbon color select, self-testing, electronic tab set, and customer defined code sets. For details contact Staff Computer Technology Corp., 10457 Roselle St., Suite J, San Diego, CA 92121.

CIRCLE INQUIRY NO. 234

Malibu Printer Interface Card

The Apple Interface Card allows Apple computer owners to take full advantage of the unique graphics capabilities of both the Apple computer and the Malibu Model 165 Printer.

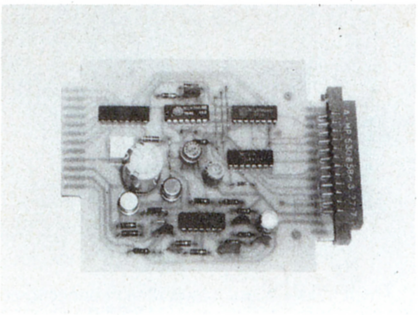
The user can print the entire standard ASCII character set of 96 printable characters using standard Apple programming techniques. The user can also define his own character set under program control. A simple CALL is provided that will transfer and print the contents of either Apple HI-RES display page.

For details contact Malibu Design Group, Inc., 8900 Eton Ave., Suite G, Canoga Park, CA 91304, (213) 998-7694.

CIRCLE INQUIRY NO. 241

Analog Interface Card

The ADAK-1 board is a general purpose analog interface for 8-bit microcomputers. It includes a monolithic D-A converter, a 5-pole low-pass filter, an audio amplifier, an 8-channel analog input multiplexor, and a comparator to perform A-D conversions.



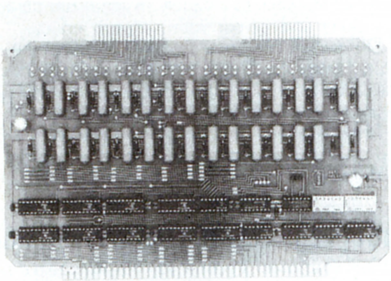
This combination permits real-time music generation or digitized outputs from up to 8 joystick channels, thermometers, light sensors, etc.

Price is $69.50. For details contact Technical Hardware Inc., Box 3609, Fullerton, CA 92631.

CIRCLE INQUIRY NO. 235

Contact Closure Module

The 96702 is a 32-point reed relay contact closure module which features 32 form A contact sets terminated at two edge-board connectors.



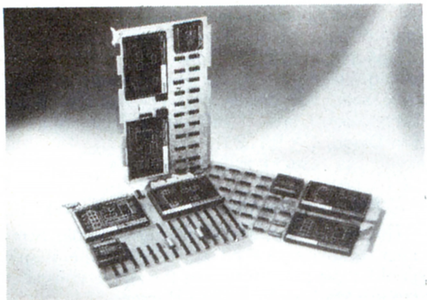
This EXORciser compatible module emulates the output function of the Motorola M68MM13B Micromodule. The 96702 can be placed at any four-byte boundary of memory by setting the starting address in DIP switches on the card.

Single unit price is $350. For details contact Creative Micro Systems, 11642-8 Knott Ave., Garden Grove, CA 92641, (714) 898-9669.

CIRCLE INQUIRY NO. 236

Data Translation Cuts Prices

Data Translation has reduced 1-9 quantity prices by up to 28% for all isolated data acquisition modules and their companion expanders. Also reduced are certain isolated analog I/O boards which utilize those components.



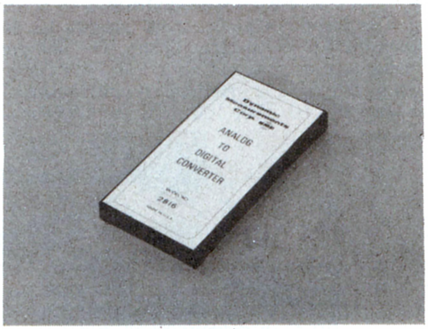
The DT5703 and DT57C03 isolated, low level, wide-range data acquisition modules are reduced from $495 to $395 and $550 to $395 respectively. The DT03EX and DTC03EX isolated, 8-differential channel expanders are also reduced down to $395. Similar savings are available on certain analog I/O boards.

For details contact Data Translation Inc., 4 Strathmore Rd., Natick, MA 01760.

CIRCLE INQUIRY NO. 237

A/D Converter Series

A new 16 and 14 bit A/D converter series from DMC provides an exceptional combination of resolution, accuracy, speed and reliability. Model 2816 converts 16 bits in 100 microseconds, and Model 2814 converts 14 bits in 50 microseconds.



There are four full-scale standard signal range selections, and built-in trimmers are provided for gain and offset.

Small quantity prices are $450 for Model 2816 and $350 for Model 2814. For details contact Dynamic Measurements Corp., 6 Lowell Ave., Winchester, MA 01890, (800) 225-1151.

CIRCLE INQUIRY NO. 238

Bidirectional I/O Ports

The Am2950 and Am2951 8-bit bidirectional I/O ports for microprocessor systems from Advanced Micro Devices can be used in any microcomputer system, including Am2900, Am9080A (8080A), Am8085A, 8086, Z80 and AmZ8000 systems.

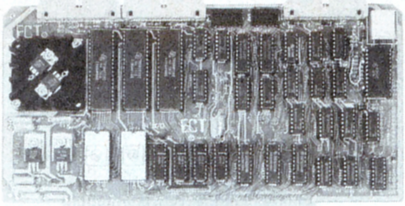
Both devices feature back-to-back, 8-bit, edge-triggered registers for storing data moving in either direction between two bidirectional, three-state buses. When operating, on-chip flip-flops provide data-transfer handshaking signals by automatically setting when the corresponding register is loaded with data.

Both devices have a 24mA output current sink capability, require a single +5V supply and come in 28-pin DIPs. Prices start at $6.95 each in 100s. For details contact Advanced Micro Devices, 901 Thompson Pl., Sunnyvale, CA 94086, (408) 732-2400, Ext. 3310, Robert Grossman.

CIRCLE INQUIRY NO. 239

R²I/O ROM, RAM and I/O Board

R²I/O is an S-100 bus I/O board with 3 serial I/O ports, 1 parallel I/O port, 4 status ports, 2K of ROM and 2K of RAM. The R²I/O provides a convenient means of interfacing several I/O devices to an S-100 bus microcomputer.



It also provides for convenient microcomputer system control from a terminal keyboard with a ROM monitor containing executive commands and I/O routines. Baud rates are individually selectable in the range of 75-9600 and the voltage levels of the serial I/O ports are RS-232.

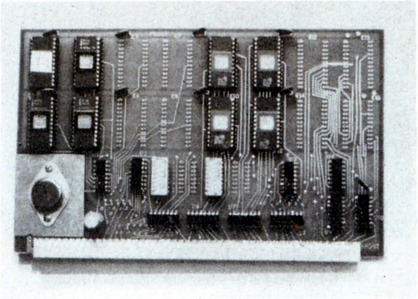
Price is $295. For more information contact Electronic Control Technology, 763 Ramsey Ave., Hillside, NJ 07205, (201) 686-8080.

CIRCLE INQUIRY NO. 240

MEMORY BOARDS

SS-50 Bus Memory

A new EPROM and RAM memory card by Digital Service & Design will service all SS-50 bus computer systems. The memory elements used are the 5 volt Intel 2716 or TMS 2516 2K x 8 EPROM and Texas Instruments new TMS 4016 2K x 8 static RAM.



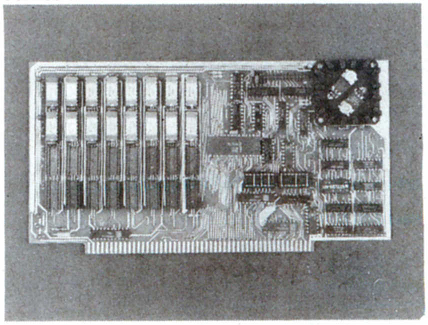
The card is designed with 4 independent addressed 8K memory blocks and DIP switch or jumper select to any 8K location.

Cards are sold bare board with edge connectors and data for $27. For details contact Digital Service & Design, P.O. Box 741, Newark, OH 43055.

CIRCLE INQUIRY NO. 242

S-100 RAM Boards Prices Reduced

Central Data has reduced prices on its 16K-64K memory boards. All Central Data memory boards come completely assembled, tested, and burned-in.

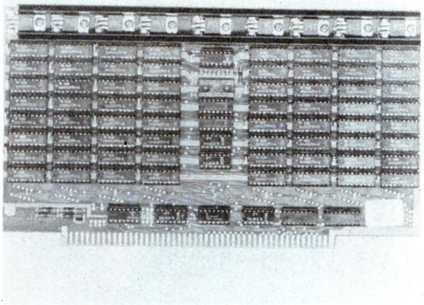


The new prices are: 16K - $249, 32K - $375, 48K - $500 and 64K - $625. For details contact Central Data Corp., P.O. Box 2482, Station A, Champaign, IL 61820, (217) 359-8010.

CIRCLE INQUIRY NO. 243

32K Tarbell RAM Memory Board

Tarbell Electronics' new 32K static RAM board is S-100 bus compatible and runs at 300ns. It features extended addressing, or bank switching, and contains nine regulators which greatly enhance its heat distribution.



The same board is available with only 16K, leaving half of the board open for future addition of chips. Both boards are assembled and tested.

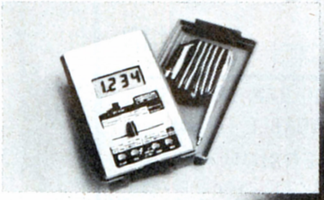
For more information contact Tarbell Electronics, 950 Dovlen Pl., Suite B, Carson, CA 90746, (213) 538-4251 or 538-2254.

CIRCLE INQUIRY NO. 244

LX303

ALL THE MOST WANTED FEATURES IN A COMPACT DVOM

BIG ½" HIGH LCD DISPLAY
USE INDOORS OR OUT
200 HOUR 9V BATTERY LIFE
AUTO ZERO, POLARITY, OVERRANGE INDICATION
100 mV DC F.S. SENSITIVITY
19 RANGES AND FUNCTIONS



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SPECIFICATIONS:
DC VOLTS (5 RANGES): 0.1mV to 1000V; Accuracy ±0.5% rdg ±0.5% f.s.; Input imped: 10MΩ; Max. input 1kV except 500V on 200mV range.
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RESISTANCE (6 LOW POWER RANGES): 0.1Ω to 20MΩ; Accuracy: ±0.5% rdg ±0.5% f.s. (±1.5% rdg on 20MΩ range); input protected to 120VAC all ranges.
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Special Package Price: $599.00
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With 16K of memory $1150.00

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JADE MEMORY EXPANSION KITS For TRS—80, Apple, & Exidy

4116's

Everything a person needs to add 16K of memory. Chips come neatly packaged with easy to follow directions. In minutes your machine is ready for games and more advanced software.

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6502 — based single board computer with keyboard/display, KIM-1 hardware compatible, complete documentation.

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KIM-1 Module monitor, programs stored in 2048 ROM Bytes. User Manual, Wall size schematic, Hardware manual, Programming manual, Programmers reference card,and Keyboard display.

SD SYSTEMS Z-80 STARTER KIT

Based on the powerful Z80 CPU, this kit is an ideal introduction to microprocessors. It has an on-board keyboard and display, plus cassette tape interface and expansion provisions for two S-100 connectors. This "Do-it-all" Board will also program the 2716 2K EPROM.

Kit.	$249.95
Assembled and Tested.	$399.95

JADE PROTO BOARD

Includes gold plated fingers, S-100 size, holds 72-16 pin dips, accomodates all 8 thru 40 pin dip packages.

$19.95

JADE VIDEO INTERFACE

S-100 Compatible Serial Interface with Sockets Included.

Kit	$117.95
Assembled & Tested	$159.95
Bare Board w/manual	$ 35.00

MEM-2 16 K Static RAM Board

Kit- (450ns)	$250.00
Kit- (250ns)	$285.00
Assembled- (450ns)	$325.00
Assembled- (250ns)	$350.00

DYNAMIC RAM BOARDS EXPANDABLE TO 64K

32K VERSION • KITS

Uses 4115 (8K×1, 250ns) Dynamic RAM's, can be expanded in 8K increments up to 32K:

8K	$159.00	24K	$249.00
16K	$199.00	32K	$299.00

4115 SALE 8 for $39.95

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Uses 4116 (16K×1, 200ns) Dynamic RAM's, can be expanded in 16K increments up to 64K:

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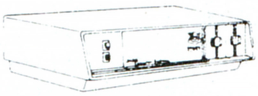
32K	$369.00	64K	$569.00

THE PIGGY MAINFRAME



THE PIGGY IS HERE!

This sleak new mainframe is neatly trimmed to hold six S-100 boards, two mini-floppy drives, and is available in five colors. Power requirements: 115/220 VAC, 50/60 HZ. Weight: 27 lbs. (with drives). Dimensions: 21.375" Wide X 8.4" High X 15.875" Deep. Power Supply: 8 volts at 18 Amps unregulated, · 16 volts at 3 amps unregulated, - 16 volts at 3 amps unregulated, · 5 volts at 3 amps regulated, · 12 volts at 3 amps regulated.

THE PIGGY (Without Drives). . . . $475.00

FLOPPY DISK INTERFACE

JADE FLOPPY DISK (Tarbell board)

Kit	$195.00
Assembled & Tested	$250.00

S.D. Computer Products VERSA-FLOPPY

Kit	$159.95
Assembled & Tested	$239.00

JADE PARALLEL/SERIAL INTERFACE

S 100 compatible, 2 serial I/O ports, 1 parallel I/O.

Kit JG-P/S	$124.95
Assembled & Tested JG-P/SA	$179.95
Bare Board w/Manual	$ 30.00

★ STATIC RAM SPECIALS ★

	1-15	16-99	100 +
2114's, low power (1024x4)			
450ns	8.00	6.95	5.50
300ns	9.00	8.00	6.50
TMS4044/MM5257, low power			
450ns	8.00	7.50	6.50
300ns	9.95	8.75	8.00
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- 12MHZ Bandwidth
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Plugs into your IMSAI or ALTAIR. 4 extra status lines, 37 page manual included, 4 extra control lines.

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STATIC RAM BOARDS

JADE 8K

Kits:	450ns	$125.95
	250ns	$149.75
Assembled & Tested:	450ns	$139.75
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Bare Board:		$ 25.00

16K — Uses 2114's (low power)
Assembled & Tested:

RAM 16	(250ns)	$375.00
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16K with memory management
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RAM 65B	(450ns)	$350.00

32K Static
Assembled & Tested:

250ns	$795.00
450ns	$725.00
250ns Kit	$575.00

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Universal/Microcomputer/Processor Plugboard S-100 Bus. Complete With Heat Sink & Hardware.
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Hi-Density Dual-In-Line Plugboard For Wire Wrap With Power & Grd. Bus Epoxy Glass 1/16" 44 Pin Con Spaced .156

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3690-12
Card Extender
Card Extender Has 100 Contacts 50 Per Side ON .125 centers. Attached Connector is Compatible With S-100 Bus Systems
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THE BIG Z
THE NEW Z-80
CPU BOARD FROM JADE

Features Include: ■ S-100 Compatible, available in 2MHz or 4MHz versions. ■ On-board 2708, 2716, 2516, or 2532 EPROM can be addressed on any 1K, 2K, or 4K boundary, with power-on jump to EPROM. ■ On-board EPROM may be used in SHADOW mode, allowing full 64K RAM to be used. ■ Automatic MWRITE generation if front panel is not used. ■ On-board USART for synchronous or asynchronous RS232 operation (on-board baud rate generator). ■ Reverse-channel capability on USART allows use with buffered peripherals or devices with "not-ready" signal.

2MHz-	Kit: CPU-30200K, 2 lbs	$149.95
	Assembled and Tested: CPU-30200A, 2 lbs	$199.95
4 MHz-	Kit: CPU-30201K, 2 lbs	$159.95
	Assembled and Tested CPU-30201A, 2 lbs	$209.95

JADE'S
DOUBLE DENSITY

DD ™

KIT: $249.00
Assmb. & Tstd: $299.00

- Single or Double Density Recording
- Full Size or Mini Floppy
- CP/M Compatible in either density
- Programmed Data Transfer, no DMA
- Controls up to 8 drives
- IBM format in either density
- Software Selectable Density

■ This controler utilizes the proven reliability of the IBM standard format as well as the lastest phase-locked-loop for data separation ■ All clocks are generated from an on-board crystal oscillator ■ Right precompensation is used to enhance data recovery reliability in the double density mode ■ Density selection is entirely transparent to the user ■ Single and double density diskettes can be mixed on the same system.

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8243	$8.00
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2513 Lower (5 volt)	$10.95
MCM6571 up scan	$10.95
MCM6571A down scan	$10.95
PROMS	
1702A	$5.00
2708	$12.95
2716 (5 12)	$49.00
2716 (5v)	$49.00
2758 (5v)	$30.00
DYNAMIC RAMS	
416D/4116 (200ns)	$12.50
2104/4096	$4.00
2107B-4	$3.95
TMS4027/4096	$4.00

STATIC RAMS	1—15	16—100
21L02 (450ns)	$1.50	$1.20
21L02 (250ns)	$1.75	$1.50
2101-1	$2.95	$2.60
2111-1	$3.25	$3.00
2112-1	$2.95	$2.65

FLOPPY DISK CONTROLLERS	
1771801	$39.95
1791	$49.95
KEYBOARD CHIPS	
AY5-2376	$13.75
AY5-3600	$13.75
MM5740	$18.00

POWER SUPPLIES

PSD-249A: For a Single 5 1/4" Disk Drive. By Power-One or Alpha Power: +/- 5V at .7A, +/- 12V at 1.1A $52.00

PSD-205A: For Single 8" Disk Drive. By Power-One. +5V at 1A, -5V at .5A, +24V at 1.5A ... $89.95

PSD-206A: For Two 8" Disk Drives. By Power-One or Alpha Power. +5V at 2.5A, -5V at .5A, +/-24V at 3A ... $125.00

Rockwell: Aim-65 Power Supply PSX-030A ... $59.95

KIM-1 or SYM-1 Power Supply: PSX-020A ... $59.95

★ DISK DRIVES ★

B51 5¼" **$295.00**
by Micro Peripherals, Inc. Operates in either single density (125KB, unformatted) or double density (250KB, unformatted) modes, up to 40 tracks, with a track-to-track access time of only 5 ms.

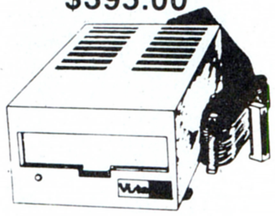
SA801R **$575.00**
by Shugart Single-sided 8" floppy disk drive.

FD8-100 **$395.00**
GSI/Siemens. Runs cooler and quieter than 801 (8")

SA400 **$325.00**
Single density 5¼, 35-Track drive. Cabinet and power supply available

1791 BO1
Dual Density Controller Chip
$49.95

Vista V80
Mini Disk
SYSTEM
FOR TRS—80
$395.00



Includes disk drive, power supply, regulator board, and compact case. The V-80 offers 23% more storage capacity. Simply take it out of the box, plug in the cable, and it's ready to run. Requires 16K, Level II, expansion interface.

Signal Cable ... $24.95

JADE
CABLE ASSEMBLIES

Mini-Disk Cable Kit: 5 1/4" interface to 2 Shugart or compatible drives. Cable is 5' long with 34 pin edge connectors WCA-3431K ... $34.95

8" Disk Cable Kit No. 1: 34 pin assembly WCA-5031K ... $38.45

8" Disk Cable Kit No. 2: 50 pin assembly (great for Tarbell disk controller) WCA-5032K ... $38.45

Signal Cables: 6 feet long, 34 pin edge connectors at each end ... $24.95
WCA-3421A

JADE
ISO—BUS
MOTHERBOARDS

Comes in either 6, 12, or 18 slot sizes. These boards with a special ground plane assures a silent operation

JADE 6 Slot	
Kit	$49.95
Assembled	$59.95
Bare Board	$24.95
JADE 12 Slot	
Kit	$89.95
Assembled	$99.95
Bare Board	$39.95
JADE 18 Slot	
Kit	$129.95
Assembled	$149.95
Bare Board	$59.95

- Two Drives Siemens/GSI 8" Floppy
- Power Supply for Above
- Jade Double Density Board (KIT)
- CP/M Operating System with Basic E
- Package of 10 Blank 8" Diskettes (Double Density)
- Includes Interface Cables

Price if Purchased Separately
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Jade Special Package Deal
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3M
or VERBATIM
FLOPPY DISKS

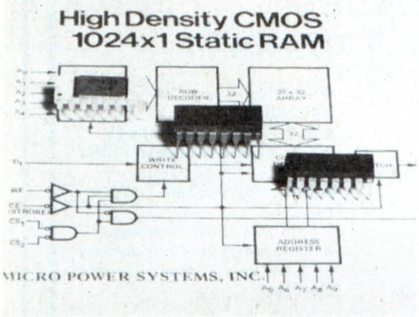
5¼ in. Minidiskettes
Soft sector, 10 sector, or 16 sector
$4.40 each or
Box of ten for $37.50

8 in. Standard Floppy Disks
$4.75 each or
Box of ten for $35.00

CIRCLE INQUIRY NO. 68

HD/CMOS 1K Static RAMs

Micro Power Systems offers a line of HD/CMOS 1K Static RAMs that have a true standby supply current value of only 1uA (typical) while in the idle or non-switching state, with a 10uA maximum.



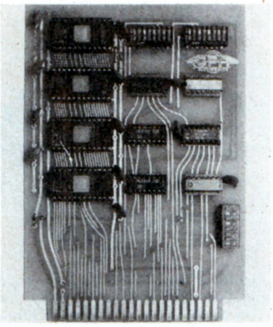
The Models MP6508 and MP6518 have a 1024x1 memory configuration, a 300ns access time, interface with a number of microprocessors and are pin-compatible with Intersil's IM6508 and IM6518.

For details contact Frank Berko, Gen. Mgr., Micro Power Systems, Inc., 3100 Alfred St., Santa Clara, CA 95050, (408) 247-5350.

CIRCLE INQUIRY NO. 245

EPROM Firmware Card

This card holds up to four 2708 EPROMs, occupying the top 4K of TRS-80 memory (F000-FFFFH).



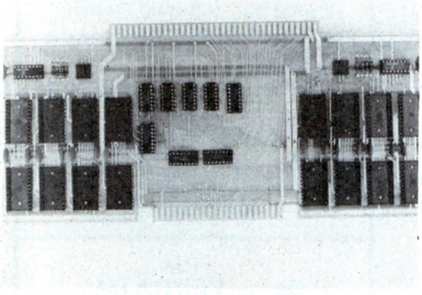
The board can also be configured to accommodate four of the new single supply Intel 2716 or TI 2516 EPROMs, for a total capacity of 8K, (E000-FFFFH), of eraseable read only memory.

For more information contact GPA Electronics, Inc., P.O. Box 7410, Oakland, CA 94601.

CIRCLE INQUIRY NO. 246

16K-Byte EPROM Card

This EPROM ard uses 2708 memories and is fully compatible with Digital Group systems. The address and data lines are buffered to protect the EPROMs.



The user may select either 8K or 16K bytes with each 8K block jumper selectable to any 8K memory boundary. Assembled and tested, ready for EPROM insertion.

Price is $99.50. 2708 EPROMs are $12.50 each. For details write PEC, 21720 Alcazar Ave., Cupertino, CA 95014.

CIRCLE INQUIRY NO. 247

32K ROM

Electronic Arrays has a fully-static 4096-word by 8-bit read-only memory — the EA-8332, the new ROM offers as program options either of the two JEDEC standard pin configurations.

The EA-8332A version incorporates CS_2 and A_{11} on pins 21 and 18 respectively; the EA-8332B incorporates CS_2 and A_{11} on pins 18 and 21 respectively.

For more information contact Electronic Arrays, 550 E. Middlefield Rd., Mountain View, CA 94043, (415) 964-4321, Richard Eiler.

CIRCLE INQUIRY NO. 248

64K RAM Board

The ZS-Systems 64K RAM board is designed to operate in any Z-80 based microcomputer having S-100 bus.

It uses 16K dynamic RAM chips and features board select, bank select, transparent on-board refresh, 2MHz or 4MHz operation (with no wait state) and memory disable.

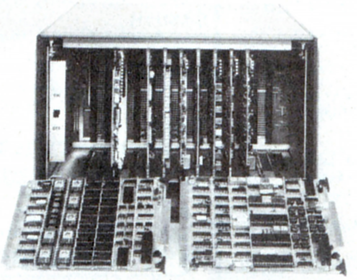
The board is compatible with Cromemco system and comes fully assembled, burned in and tested. For details contact ZS Systems, P.O. Box 1847, San Diego, CA 92112, (714) 447-3997.

CIRCLE INQUIRY NO. 249

MODEMS

ATE Data Coupler

Automated test equipment (ATE) system designers can now use a microprocessor based system to down-load their central computer and run BASIC language programs, freeing the central computer for other uses.



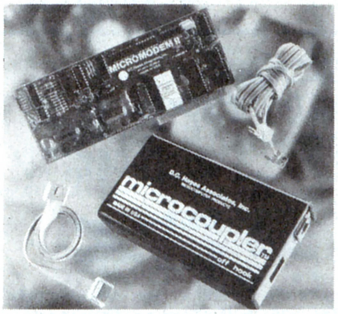
The new system, 53A-MPX, can be used to create a stand alone data acquisition and control system or function as an intelligent satellite in a distributed processing system.

For more information contact Computer Data Systems, Inc., 186-58 Homestead, Morrison, CO 80465, (303) 697-8014.

CIRCLE INQUIRY NO. 250

Apple Modem

The Micromodem II^{TM} data communications system for the Apple II available from D.C. Hayes, can transmit data between one Apple II and another, a terminal, another microcomputer, a minicomputer or even a large time-sharing computer over regular telephone lines.



The System includes serial I/O, 1K byte of firmware, a 103 compatible modem and an FCC registered interface.

For details contact D.C. Hayes Associates, Inc., P.O. Box 9884, Atlanta, GA 30319, (404) 455-7663.

CIRCLE INQUIRY NO. 251

Acoustic Coupler/Modem

HOTLINE is a 0-1200 baud acoustic coupler for voice grade telephone lines and long distance direct dial systems. The Model TC3003 has been designed to add a completely new dimension to the transfer of data over unconditioned lines.

The TC3003 offers a full set of test functions and system troubleshooting and is compatible with all computer systems and data terminals using Bell 103 handshakes.

For details contact Tek-Com Inc., 1147 Sonora Ct., Sunnyvale, CA 94086, (408) 736-3282.

CIRCLE INQUIRY NO. 252

Statistical Network Processor

The SNP-1000 is a microprocessor-controlled data communications device that functions as an intelligent concentrator and statistical time division multiplexer.

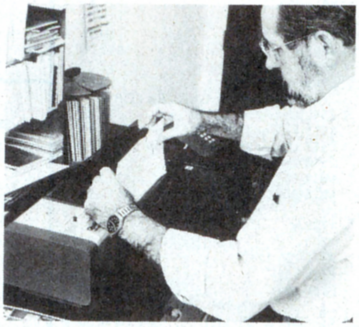
The new device features a unique multipoint option that allows the user to poll a number of remote sites along a single transmission line.

Price for the four-channel SNP-1000 is $1,500. For details contact Prentice Corp., 795 San Antonio Rd., Palo Alto, CA 94303, (415) 494-7225, Bill Myers.

CIRCLE INQUIRY NO. 253

Qwip Two

Qwip Systems' new Qwip Two unit is a low cost, medium-speed transceiver, capable of communicating on a worldwide basis.



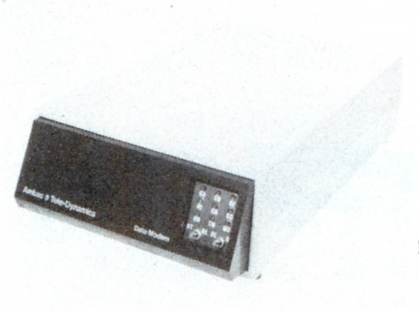
Qwip Two's electronic design has several key features which will make medium speed facsimile transmission and reception more efficient and less costly.

For more details contact Qwip Systems, Div. of Exxon Enterprises Inc., 1270 Ave. of the Americas, New York, NY 10020, J.W. Holland.

CIRCLE INQUIRY NO. 254

1200-bps Bell Compatible Modem

Tele-Dynamics offers a new, highly cost-effective, 0 to 1200-bps modem which is Bell 202S (or CCITT V.23) compatible and connects directly to the public switched telephone network without the need for leasing a Bell System DMA.



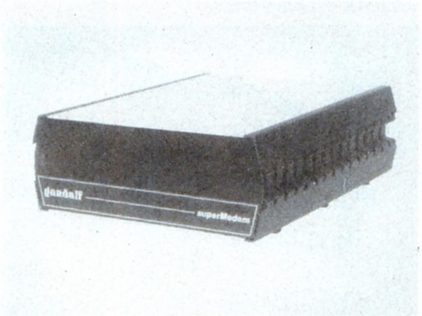
The 7202S modem provides either automatic or manual answering and operates half-duplex on 2-wire lines.

For details contact Tele-Dynamics Div. of AMBAC Industries, Inc., 525 Virginia Dr., Ft. Washington, PA 19034, (215) 643-3900.

CIRCLE INQUIRY NO. 255

9600 BPS Modem

The SM 9600 (superModem) is a full duplex, synchronous intelligent modem for high speed long distance data communication. SuperModem transmits data thousands of miles at 9600 bps over unconditioned voiceband data channels (3002) and by using an unconventionally low baud rate achieves a substantially higher tolerance to the transient noise hits inherent in communication networks.



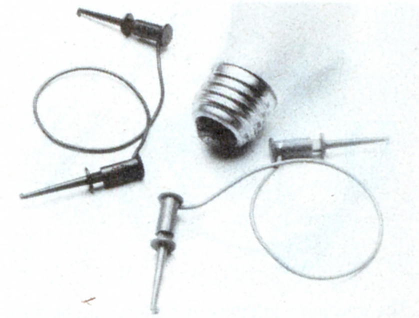
For more details contact Gandalf Data, Inc., 1019 S. Noel, Wheeling, IL 60090.

CIRCLE INQUIRY NO. 256

TEST EQUIPMENT

Micrograbber Patch Cord

The Model 4613 is a double-ended micrograbber patch cord from ITT Pomoma Electronics. Model 4613 is available in lengths 12, 24, 36, 48 and 60 inches in either red or black.



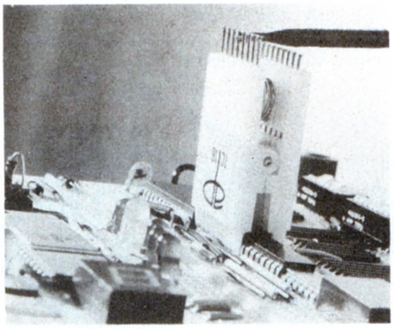
Contacts are gold plated beryllium copper. The insulation is glass-filled nylon that will withstand temperatures to +102°C.

Prices range from $1.95 to $2.15 each. For details contact ITT Pomona Electronics, 1500 E. 9th St., Pomona, CA 91766.

CIRCLE INQUIRY NO. 257

Super Grip II Test Clip

Super Grip's new "duck bill" contacts are flat, won't roll off IC leads. Open-nose construction enables probe at IC leg. Pin rows are offset for easy attachment of probes.



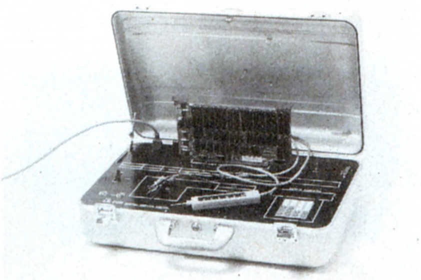
Contacts are gold-plated phosphor bronze. "Contact comb" construction separates contacts with precision.

For details contact AP Products Inc., Box 110, Painesville, OH 44077, (216) 354-2101.

CIRCLE INQUIRY NO. 258

"Signature Based" Digital Service Test System

The LS-800 is a new test system that provides a complete Digital Test Bed with self-contained built-in computer for bus control, test stimulus drive, parallel and serial I/O and operator communications.



External automatic probing of UUT test points through expandable 32 line multiplexers allow card edge connectors, dip clips, and bed of nails fixturing.

For more information contact Phoenix Digital Corp., 3027 N. 33rd Dr., Phoenix, AZ 85017.

CIRCLE INQUIRY NO. 259

Linear/Analog Tester

LTX Corporation is offering its new MTS-77 Spacesaver Modular Linear/Analog Test System. The system offers space savings of as much as 50% in a typical user configuration.

A test station incorporates the test heads in the station rack so final test handlers can be placed alongside rather than out front, thus reducing both space and cabling requirements. The new test station with incorporated heads, designated the TS-80, also can be added to current MTS-77 systems.

For full specifications contact LTX Corp., 160 Charlemont St., Newton Highlands, MA 02161 or 2330 Walsh Ave., Santa Clara, CA 95050.

CIRCLE INQUIRY NO. 260

Low Cost General Use DMM

Kontron Electronic, Inc., offers its model DMM 3020 high performance, low cost digital multimeter. The DMM 3020 has a 3½-digit LED display, 100uV, nA, or mohm resolution, ±0.1 percent-of-reading accuracy, and 28 measurement ranges for AC/DC voltages, currents, and resistance.

Prices start at $195. For more information contact Kontron Electronic, Inc., 700 S. Claremont St., San Mateo, CA 94402.

CIRCLE INQUIRY NO. 267

Digital IC Test System

The INSPECTOR 100 is a fully programmable digital IC test system. The system performs both functional and DC parametric tests for devices from 14-24 pins which operate from 4.5 to 5.5V.

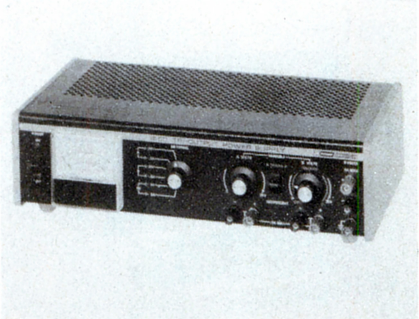
This allows testing of SSI and MSI parts from TTL, low power Schottky TTL, Schottky TTL, DTL, NMOS and CMOS families.

The Inspector 100 is controlled by the TBASIC test language. Price is $8,900. For details contact Pragmatic Designs, Inc., 711 Stierlin Rd., Mountain View, CA 94043, (415) 961-3800.

CIRCLE INQUIRY NO. 261

Lab Power Supply

B&K-Precision's new lab power supply is capable of functioning as three separate power supplies and features an exclusive automatic tracking circuit. The Model 1650 offers a 5 volt DC, 5 amp output and two separate A and B 25 volt DC outputs at 0.5 amp. The automatic tracking circuit allows the B output to "track" voltage changes of the A supply.

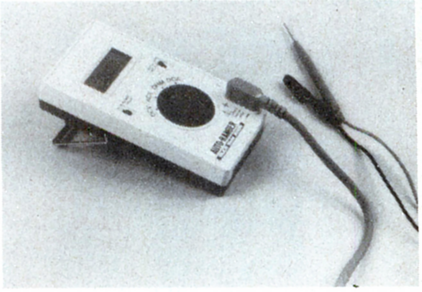


Price is $275. For details contact B&K-Precision Sales Dept., 6460 W. Cortland St., Chicago, IL 60635, (312) 889-9087.

CIRCLE INQUIRY NO. 262

DMM Autoranger

Alco Electronics offers a portable auto-ranging digital multimeter. This new instrument features minimal controls and a large 3½ digit LCD readout for measurement of DC or AC (RMS) voltage, DC current and Ohms, with full auto-ranging function from zero to 1000 volts (DC or AC), 2000 K-ohms or 200 mA. Model 2000A also has auto-zeroing, overload protection, and auto-polarity sensing.

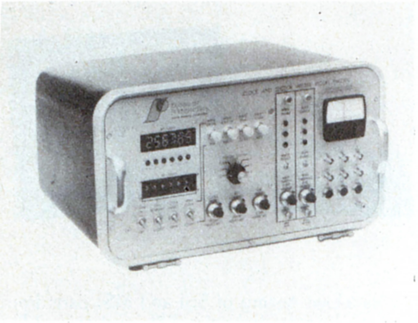


Suggested list price is $195. Delivery is 2 weeks. For more information contact Alco Electronic Products, Inc., 1551 Osgood St., N. Andover, MA 01845, (617) 685-4371.

CIRCLE INQUIRY NO. 263

Clockwriter

Pioneer Magnetics has a Clock and Sector Writer that writes "Winchester" type timing and servo tracks in many applications. The PM2390 clockwriter provides state-of-the-art performance in a compact portable package suitable for the production line, field service, or the broad applications of the engineering design lab.

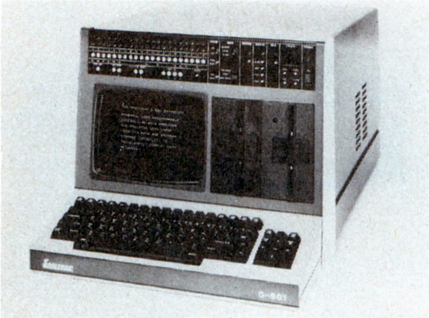


Basic unit price is $9,950. For details contact Pioneer Magnetics, Inc., 1745 Berkeley St., Santa Monica, CA 90404, (213) 829-6751.

CIRCLE INQUIRY NO. 264

Datascope

The D-901 Datascope is the newest, most powerful member of Spectron's Datascope family of monitors and data analyzers. The D-901 Datascope combines the capability of a powerful, programmable interactive data analyzer and emulator with two versatile large-capacity data storage and retrieval devices to provide all the tools necessary to troubleshoot complex network problems.



For more information contact Spectron Corp., 344 New Albany Rd., Moorestown, NJ 08057, (609) 234-5700.

CIRCLE INQUIRY NO. 265

LCD Multimeter

The Model ME-523 is a 3½ digit LCD multimeter that has a HI-LO ohm switch for all ranges, five function modes — DCV, ACV, DCmA, ACmA, and Ohms — automatic polarity indication, and automatic zero adjustment.

The ME-523 can measure DC voltages from 0.2 to 1000 volts, AC voltages from 0.2 to 600 volts, DC and AC current from 0.2 to 1000 mA, and resistance from 0.2 ohm to 20 megohm.

For details contact Soar Electronics Corp., 200 13th Ave., Ronkonkoma, NY 11779.

CIRCLE INQUIRY NO. 266

POWER SUPPLIES

Super Isolator

Super-Isolator is designed to curb severe AC power line spikes, surges and hash, prevent crashes, memory loss and program glitches and eliminate equipment interactions.

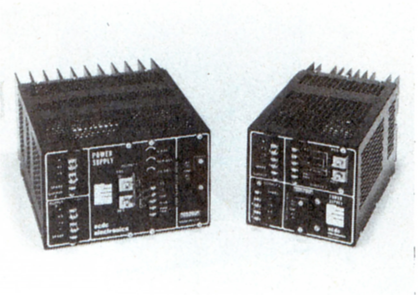
Incorporating heavy duty surge/spike suppressors, the Super-Isolator features 3 individually super-filtered 3-prong AC sockets.

Price is $72.95 (Model ISO-3). For details contact Electronic Specialists, Inc., 171 S. Main St., Natick, MA 01760, (617) 655-1532.

CIRCLE INQUIRY NO. 268

Switching Power Supplies

ACDC Electronics is expanding their series of RS/RT switchers with 4 new triple output models designed to meet increasing microprocessor applications.



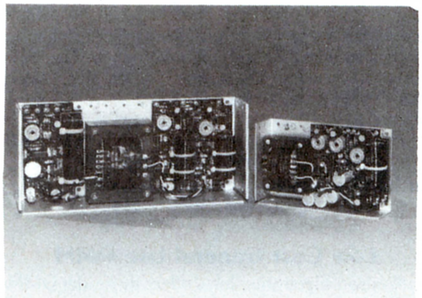
Models RT153, RT154, RT303 and RT304 employ isolated auxiliary outputs of 5 and 12 volts or 5 and 15 volts in addition to the main 5 volt output.

Prices start at $415. Contact ACDC Electronics, 401 Jones Rd., Oceanside, CA 92054.

CIRCLE INQUIRY NO. 269

Power-Fail Detector/Power-On Reset

Wintek's new option for their line of microprocessor power supplies provides advance knowledge of an imminent power failure so that a computer can execute a power down before becoming inoperable.



In addition, the option provides a reliable, debounced, power-on reset signal when power is restored, so a start up sequence can be initiated.

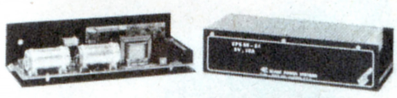
Wintek designed this function into the power supply and is available as a built-in option.

Single unit price is $24.50. For details contact Wintek Corp., 902 N. 9th St., Lafayette, IN 47904, (317) 742-6802.

CIRCLE INQUIRY NO. 270

60 Watt Switching Power Supply

The EPS60 provides a single output of 60 watts at 55°C or 75 watts at 40°C, in voltages from 5 to 24 volts. This new unit provides ±0.1% line/load regulation with less than 50mv p-p ripple and noise to 350MHz.



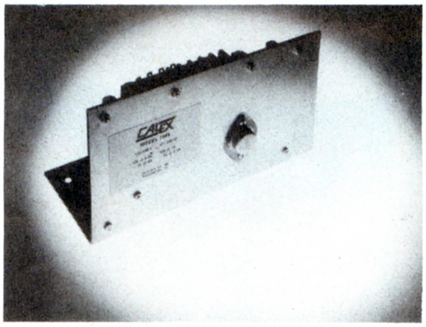
Remote sense, overvoltage protection, and power fail are standard features. The EPS60 is available in both open frame and closed frame configurations.

Open frame quantity price is under $90. For details contact Elpac Power Systems, 3131 S. Standard Ave., Santa Ana, CA 92705, (714) 979-4440.

CIRCLE INQUIRY NO. 271

Microprocessor Power Supply

The Model 7248 is a fully self-contained open frame power supply designed to provide closely regulated DC voltage at popular microprocessor voltage and current levels.



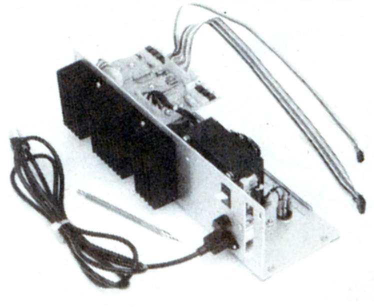
The Model 7248 incorporates a large metal chassis for easy mounting while simultaneously providing the required heat sinking.

Price is $129. For details contact Calex Mfg. Co., Inc., 3355 Vincent Rd., Pleasant Hill, CA 94523, (415) 932-3911, Ron Kreps, Sales Mgr.

CIRCLE INQUIRY NO. 272

Controller/Power Supply

Model DP-8000 is Pertec FT8000A plug-for-plug compatible. The formatter/power supply is available to control dual 6400 bpi cartridge transports made by Data Electronics, Inc. (DEI).



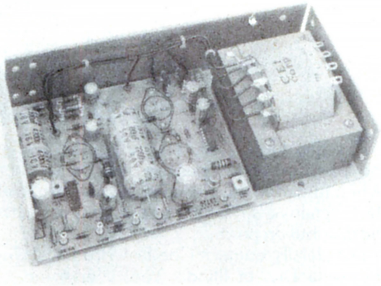
The intelligent interface is designed to be software transparent. It utilizes 8085A technology and allows up to 32K record lengths.

Under $1200 in 100s. For details contact Alloy Engineering Co., Computer Products Div., 908 Concord St., Framingham, MA 01701, (617) 620-1710.

CIRCLE INQUIRY NO. 273

Floppy Disk Drive Power Supply

The CEI Model FD302 is a low cost, open frame power supply for OEM use in dual floppy disk drives that provides regulated outputs of +5 Vdc at 3 amps with OVP, −5 Vdc at ½ amp, and +24 Vdc at 3 amps.



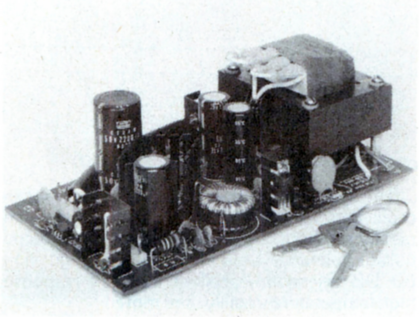
For reliability, components used include infinitely adjustable, hermetically sealed cermet pots; cerdip ICs; and metal pass transistors.

Price for 1-10 is $84 each. For more information contact CEI Corp., P.O. Box 501, Grenier Industrial Park, Londonderry, NH 03053, (603) 623-8888, Robert Crandall, Marketing.

CIRCLE INQUIRY NO. 274

"International" Power Supply

Conver Corporation offers the 2000I series of supplied designed to operate from any line voltage, world-wide. This 27 watt output supply is compatible with all popular microprocessor systems.



The unit is designed to meet all domestic and foreign safety and RFI standards, including UL, CSA, VDE and S.E.V.

Prices start at $110. For details contact Conver Corp., 10631 Bandley Drive, Cupertino, CA 95014, (408) 255-0151.

CIRCLE INQUIRY NO. 275

COMPONENTS

Indicator and Panel Meters

A completely new line of panel and indicator meters is being offered by Imtronics. The line includes level, tuning, balance, S, DC current and voltage meters as well as battery checkers.

The meters feature powerful and stable magnetic cores, carbon steel pivots, jeweled bearings for maximum accuracy, phosphor bronze springs, and air-tight anti-static cases.

The accuracy for miniature meters is 10% at any point of the scale; standard meters have accuracies of 5% at any point of the scale; tighter tolerances available on request. Specials for all types of applications are also available.

Minimum quantities — 500. For more information contact Imtronics Industries Ltd., 813 2nd St., Ronkonkoma, NY 11779, (615) 981-3434, Steven Cohen, President.

CIRCLE INQUIRY NO. 276

Microport 8 Panel Display

The Microport 8 is an 8-digit, self-contained, general purpose panel display. Packaged much like a DPM, it contains all the timing, memory and multiplexing circuitry required for simple interfacing to an 8-bit microprocessor port.

Err-A028
TELESIS LABORATORY
MICROPORT 8

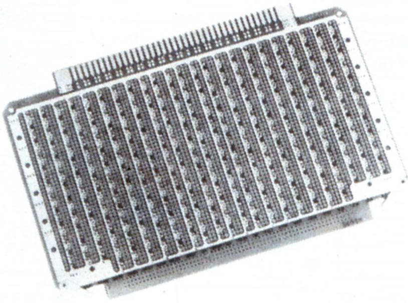
The processor provides the unit with an 8-bit output word only when the display is to be updated (3 bits to select the character to be updated, 4 bits to select the data and 1 bit to strobe).

Price is $109. For details contact Jim Eley, Telesis Laboratory, P.O. Box 1843, Chillicothe, OH 45601, (614) 773-1414/5157.

CIRCLE INQUIRY NO. 277

High Density Panels

The 316 family of panels is designed for the high density packaging of dual-in-line packages and to be bus compatible with the Motorola 6800 EXORciser.



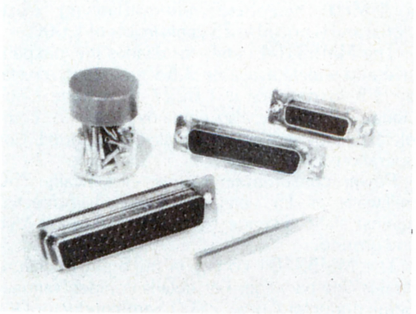
Rows of socket terminals in 17 repetitive sections of .300" with .100" between sections permit high density packaging of devices with .300" spacing. The panel fully loaded with 16 pin ICs will handle 100 devices.

Price in 10s is $211 each. For details contact Mupac Corp., 646 Summer St., Brockton, MA 02402.

CIRCLE INQUIRY NO. 278

Crimp, Rear-Release Connectors

The S*MA Series Mark III line of crimp, rear-release sub 'D' subminiature connectors are qualified to MIL-C-24308. Utilizing rear-release contact assembly allows rear insertion, release and extraction of crimp snap-in contacts.



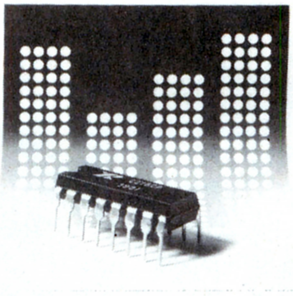
The crimp type termination accommodates standard sizes of AWG stranded wire and is rated for 5 amps. S*MA Series Mark II is constructed of a two-piece, thermoset plastic insulator with metal contact retention clip, and is available in 5 shell sizes.

For details and prices contact Souriau, Inc., 7740 Lemona Ave., Van Nuys, CA 91405, (213) 787-5341, Ext. 281.

CIRCLE INQUIRY NO. 279

Bar Graph Generator

The XR-2276 is a bar-graph generator integrated circuit to interface with fluorescent or LED displays. The new IC is a 12-point level detector designed for use as an "audio-level" indicator in high-fidelity or stereo audio equipment.



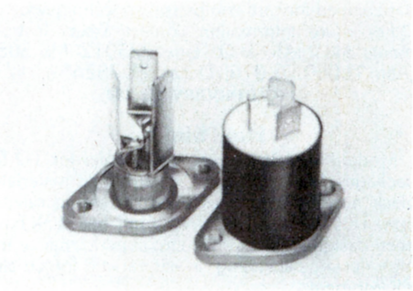
The XR-2276 contains an input buffer amplifier, 12 high-gain comparators with independent buffered outputs, an internal voltage reference and a bias-setting resistor string.

Price is $2 each in 100-up. For details contact Exar Integrated Systems, Inc., 750 Palomar Ave., Sunnyvale, CA 94088, (408) 732-7970.

CIRCLE INQUIRY NO. 280

UL-Recognized Motorola Triacs

Motorola has put its 15 A to 40 A triacs, the MAC20/25/50 in a new package with quick connect/disconnect terminals that make them ideal for both consumer and industrial applications.



The 200 to 800-volt triacs are designed primarily for full-wave control of ac loads and are electrically isolated from the mounting base.

Prices (100-up) range from $2.69 to $7.58. For details contact Motorola Semiconductor Products, Inc., P.O. Box 20912, Phoenix, AZ 85036, (602) 244-6437, Jack Takesuye.

CIRCLE INQUIRY NO. 281

Miniature Freeze Sensor

MCI's unique freeze sensor activates its switch contacts when temperatures fall below a pre-set level. It operates on an electro-ceramic principle providing narrow reset values and complete moisture protection.

Switch may be used on pipe line heat tracers, energy management systems, and all types of outdoor equipment. Activation can be used to light warning lamps, sound sirens, or turn on heating elements.

This small switch is available in standard epoxy package or high temperature version for normally high ambient temperatures.

For details contact Midwest Components, Inc., 1981 Port City Blvd., Muksegon, MI 49443, (616) 777-2602.

CIRCLE INQUIRY NO. 282

Anti-Wicking Solder Tab Sockets

Cambion is now offering a wide line of new, low-profile tab sockets with KAPTON® sealed bottoms to prevent splashing or wicking of solder. The sockets measure only .159" above the board, have red glass-reinforced nylon bodies with electro tin contacts.

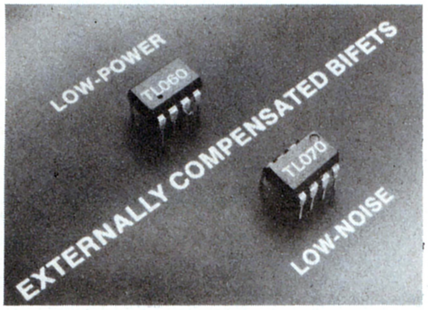
When applied to Cambion solder tab sockets, KAPTON effectively seals the area around every pin to provide a thin yet strong barrier against entry of solder or solvents into the contact area.

For more information contact Cambridge Thermionic Corp., 445 Concord Ave., Cambridge, MA 02138, (617) 491-5400.

CIRCLE INQUIRY NO. 283

BIFET Operational Amplifiers

The TL061 low-power and the TL071 low-noise families of BIFET operational amplifiers (op amps) have been expanded by the addition of new devices which offer the option of external compensation.



The low-power TL061 family adds the TL060, which offers the same low-power characteristic of only 0.25 milliamperes supply-current. The TL071 family of low-noise BIFETs has added the TL070, which features a typical equivalent input-noise voltage of only 18 nanovolts per square-root of frequency.

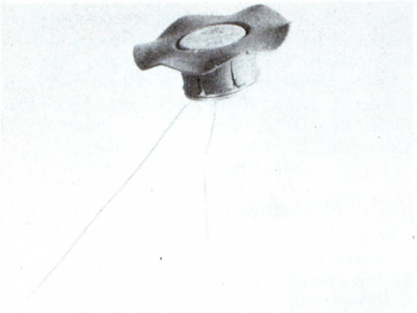
Both the TL060 and TL070 have external terminals which allow the designer to tailor the ac response characteristics of the amplifier using standard or feed-forward compensation techniques.

For more information contact Texas Instruments Inc., IAS, P.O. Box 225012 MS-308 (Attn: TL060/TL070), Dallas, TX 75265.

CIRCLE INQUIRY NO. 284

Heat Sinks

Model No. 136 "Press On" cooler for TO-5 packages, fabricated from ½ hard brass material, black nickel plated. Has excellent spring retention. This inexpensive "Press On" heat sink has been designed to improve circuit performance in high density packaging, in natural and forced air environments.



Model 136 requires no additional board area and can be installed after circuit board has been assembled. If the application calls for exceptional thermal performance or just upgrading transistors reliability, try "Press On" cooler.

For details contact AHAM Tor, 27901 Front St., Rancho California, CA 92390.

CIRCLE INQUIRY NO. 285

Mounting Bases

Kulka Electric has a complete line of terminal mounting base configurations including single or double row, flat mount, insulated feed-thru, stud and turret, and their exclusive printed circuit Hi-Rise™.

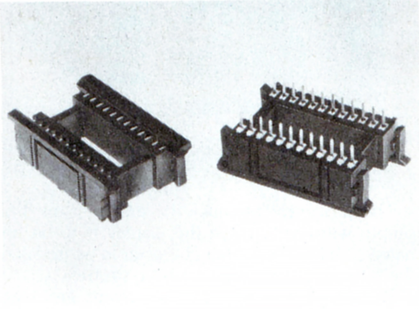
The company's catalog not only contains product information, but is a comprehensive manual containing design, application and molded material information, as well as engineering drawings which can be used to establish quality control standards for specifying terminal boards.

For catalog or details write Kulka Electric Corp., 520 S. Fulton Ave., Mt. Vernon, NY 10551.

CIRCLE INQUIRY NO. 287

Zero Insertion Force IC Connector

Scanbe's 24-pin ZIF model features actuating bars on each side of the connector that open and close the contacts which hold the IC firmly in position. The connector has normally closed contacts to prevent accidental opening of contacts.



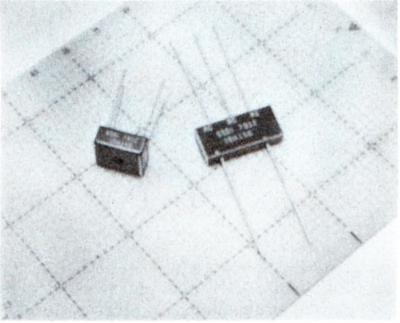
Contact resistance of the IC connector after conditioning is 14 milliohms; withdrawal force after conditioning is 30 grams.

For details contact Scanbe Div. of Zero Corp., 3445 Fletcher Ave., El Monte, CA 91731.

CIRCLE INQUIRY NO. 286

0.5A High-Voltage Bridges

Two new 0.5A bridge assemblies from Solid State Devices provide single- or three-phase, full-wave rectification. The single-phase SDA 249 series and three-phase SDA 198 series provide peak inverse voltages from 1.5kV to 4kV with sine wave inputs from 1050V to 2800V. Applications include video displays, x-ray and other high-voltage, low-current circuits.



SDA 249 single-phase bridge prices range from $10 to $40 each in 100s. SDA 198 three-phase bridge prices are from $18 to $50 each in 100s. Delivery is stock to 30 days ARO. For details contact Solid State Devices, inc., 14830 Valley View Ave., La Mirada, CA 90638, (213) 921-9660.

CIRCLE INQUIRY NO. 288

CMOS Circuit

A low-cost CMOS clock generator IC produces a 1-MHz, two-phase non-overlapping clock signal and is priced at 25 cents in lots of 1,000.

The MM53104 generator divides the inexpensive and widely available 3.58 megahertz crystal by 3.5 to produce a 1.0227 megahertz clock signal. The device also contains a second, completely independent oscillator, designed for operation at 4.5 megahertz.

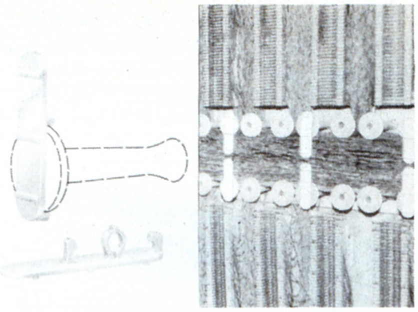
Power consumption is low — typically 250 milliwatts at 15 volts. All pins are protected against static damage by diode clamps on Vcc and ground.

The MM53104 comes in an 8-pin miniature dual-in-line package. For details contact National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, CA 95051.

CIRCLE INQUIRY NO. 290

Distribution Post Caps

Wires are kept in their proper channels and good housekeeping is assured by the use of new Comfast™ Distribution Post Caps. These unique self-retaining caps snap securely onto standard "mushroom" posts used for horizontal runs on 187 B1 back panels.



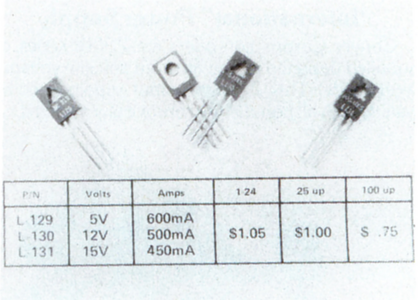
The cap turns easily on the post and when in the open position, permits fast lay-in cabling. When turned to the closed position, the cap effectively retains even large bundles of wires between the distribution posts.

For details contact Comfast Products Unit of Fastex, a Div. of Illinois Tool Works Inc., 195 Algonquin Rd., Des Plaines, IL 60016.

CIRCLE INQUIRY NO. 289

Monolithic Spot Regulators

Energy Electronic Products has three new silicon monolithic spot regulators in Jedec TO-126 plastic packages, designated L-129 (5V.6A), L-130 (12V.5A) and L/131 (15V.45A).



P/N	Volts	Amps	1-24	25 up	100 up
L-129 L-130 L-131	5V 12V 15V	600mA 500mA 450mA	$1.05	$1.00	$ .75

The new regulator features internal *overload* protection, short circuit protection, low impedance output, up to .6A output, tight output voltage tolerance, less than 1% load regulation, 60 DB rejection, excellent transient response, high temperature stability, and more.

For details contact Energy Electronic Products Corp., 6060 Manchester Ave., Los Angeles, CA 90045, (213) 670-7880, Tom Nixon.

CIRCLE INQUIRY NO. 291

LITERATURE

Application Notes

Analog Dialogue — Free — Volume 13, No. 1 issue contains application notes and new product descriptions. Applications include discussion of a measurement and control oriented software developed from BASIC, a reaction-tank temperature control system, application of signal conditioning cards to interface process signals with control systems, and a battery test system.

New product descriptions include integrated circuit temperature probes and digital display meters, analog input/output boards for DEC LSI 11/2 microcomputers, digital-to-synchro converters and low-cost analog-to-digital converters.

Write Analog Devices, Inc., P.O. Box 280, Route 1 Industrial Park, Norwood, MA 02062.

CIRCLE INQUIRY NO. 292

Software Catalog

Charles Mann & Associates has a software products catalog supporting the Apple II computer. The catalog features full capabilities descriptions of their fifty program versions currently available.

The CMA line includes business accounting, accounts receivable, inventory, BASIC teaching and other special purpose business applications.

Available from dealers or contact Charles Mann & Associates, Micro Software Div., 1926 S. Veteran Ave., Los Angeles, CA 90025.

CIRCLE INQUIRY NO. 293

Children's Books

The Computer Alphabet Book by Elizabeth S. Wall is the first title in the non-fiction juvenile "Beginning Computer Literacy Series" to be published by Bayshore Books. The series' objectives are to improve the young child's knowledge and awareness of computers, to demystify the computer, and to prepare the child to relate effectively to a computer society.

Written and designed for Gr. 1-6 children, the text and illustrations are consistent with the abilities and interests of young children. The edition is 8½" x 11" with 2 color line illustrations, unpaged and comes in a cloth, Singer sewn, casebound library binding.

Retail price $8.95. Contact Bayshore Books, Dept. NR, P.O. Box 848, Nokomis, FL 33555.

CIRCLE INQUIRY NO. 294

ASCII Display Terminal Sheet

A new two-page product sheet that provides detailed specifications of the *concept 100,* an ASCII display terminal from Human Designed Systems, Inc., is available at no charge from the company.

The concept 100 integrates unique, easy-to-use applications-oriented capabilities and proven design features into what the company calls "the industry's top ASCII price-performance package."

Information on its capability in such applications areas as text editing, data entry and retrieval, and business graphics is provided.

Contact Human Designed Systems, Inc., 3700 Market St., Philadelphia, PA 19101, (215) 382-5000.

CIRCLE INQUIRY NO. 295

Solid State Relay Specifications

A new detailed specification guide provides specs for a wide variety of solid state relays. Both chassis mount and PC board type relays are included; ratings from 3 to 45 amps; both AC and DC control; and load voltages from 100 to 600 VAC. This publication also includes surge current ratings which show ratings for peak current versus time.

Contact Opto 22, 5842 Research Dr., Huntington Beach, CA 92649, (714) 892-3313.

CIRCLE INQUIRY NO. 296

Minicomputer Solutions

DDC Publications announces a new report to address the kinds of problems mini- and microcomputer users experience.

Early subjects will include audits and audit trails; tape and disk cleaning, repair and certification; renting equipment for short term projects; hiring programmers, data entry operators and machine operators; buying supplies; identification and solution of site problems such as low voltage and static; storage of floppies, printouts, disk and tape; scheduling efficiencies and more.

Minicomputer Solutions will be published monthly. Rates are $48 for 1 year, $70 for 2 years and $88 for 3 years. Contact Data Decisions Corp., 5386 Hollister Ave., Santa Barbara, CA 93111.

CIRCLE INQUIRY NO. 297

New From Sams

The S-100 & Other Micro Buses by Elmer C. Poe and James C. Goodwin examines the bus, the key to system expansion in a microcomputer through which the microprocessor communicates with the system components.

Chapter 1 acquaints the reader the facts about buses. Then, the mechanical data, pinout designations, and bus signal definitions of the 11 most widely used bus systems are listed and explained in the following chapters.

Many photographs and pinout drawings are shown so that a better understanding of microcomputers, interface boards, and buses can be realized. List price is $595. For details contact Howard W. Sams & Co., Inc., 4300 W. 62nd St., Indianapolis, IN 46206, Robert Soel.

CIRCLE INQUIRY NO. 298

CADO 20/IV Color Brochure

Cado Systems Corporation has published a 12-page full color brochure describing its multi-terminal, multi-tasking CADO 20/IV business system.

The multi-tasking CADO System 20/IV can process as many as four applications simultaneously, so the same system can be used for word processing, message processing, remote inquiry, and transaction processing.

For a copy contact Cado Systems Corp., 2730 Monterey St., Torrance, CA 90503, (213) 320-9660.

CIRCLE INQUIRY NO. 299

"ABC's of DC to AC Inverters"

The subject of transistor-based dc to ac inverters has been discussed in literature for more than two decades. Such information has been published in a wide variety of sources ranging from textbooks and handbooks to conference and symposium papers to articles in the journals of the industry. Now, all of this information has been reviewed and edited into an all-encompassing application note, made available by Lansdale Transistor & Electronics, Inc., Phoenix, Arizona.

Among the design examples included are those for inverter transformer design; inverter starting circuits; and inverter speed-up circuits. Also included are design examples for sinusoidal output inverters; precision frequency inverters; inverter voltage regulation; and multiphase inverters.

For a copy, write on company letterhead to Lansdale Transistor & Electronics, Inc., 3600 W. Osborn Rd., Phoenix, AZ 85019, Rick Heinz.

CIRCLE INQUIRY NO. 300

Data Communications Standards Library

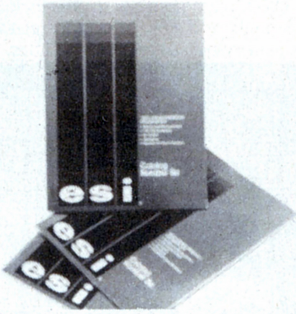
Remark International has available a new book entitled "Data Communication Standards Library" which contains all of the most important American communications industry specifications. Consisting of 330 pages, this new reference contains six EIA RS standards, three EIA Industrial Bulletins, a complete description of IBM's Binary Synchronous Communications and an ATT description of their Advanced Communications Service (ACS) Host and Terminal Functional Interface.

Price is $85. Contact Remark International, 4 Sycamore Dr., Woodbury, NY 11797, (516) 367-3806.

CIRCLE INQUIRY NO. 301

RCL Bridges, IC Testers Catalog

A full line of precision impedance and resistance measurement instruments, IC testers, standards and calibration components from Electro Scientific Industries is offered in their revised Catalog Number 8a.



Complete description, specifications, and photos accompany all products, ranging from internationally recognized resistance standards to microprocessor-based instruments, including a D/A converter tester and automatic RCL bridges.

Over 60 instruments and components are covered in all. Contact Electro Scientific Instruments, Inc., 13900 N.W. Science Park Dr., Portland, OR 97229, (503) 641-4141, Stan Gressel.

CIRCLE INQUIRY NO. 302

Monolithic Filter Data Sheet

Technical specifications of a 4-pole monolithic crystal filter, for operation at 75 MHz, are given in a data sheet prepared by the Reeves-Hoffman Division of Dynamics Corporation of America.

The new filter, which is in stock for immediate delivery, is ideally suited to communications circuitry where harmonic interference can be a problem. Request data sheet F17608, Reeves-Hoffman, 400 W. North St., Carlisle, PA 17013, (717) 243-5929.

CIRCLE INQUIRY NO. 303

Nuclear Medicine Brochure

"Gamma-11 for Nuclear Medicine," a brochure available from Digital Equipment Corporation, describes Digital's Gamma-11 computerized system for use by hospitals and medical clinics for non-invasive, dynamic organ function studies.

The brochure discusses applications and advantages of Gamma-11 real-time operation in acquiring, processing, storing, and displaying information from single and multiple gamma cameras, and includes several four-color reproductions of Gamma-11 video display output samples.

To obtain a copy, request brochure number EA 15227-93 from Printing and Circulation Services, Digital Equipment Corp., 444 Whitney St., Northboro, MA 01532.

CIRCLE INQUIRY NO. 304

Publications on Business Computing

BusinessComputing Press has announced a series of publications informing businessmen and professionals about the effective utilization of low-cost microcomputers in their business.

The bimonthly journal, BusinessComputing Review, provides in-depth research reporting on business computers and applications software. Reviews of major products are prepared through extensive testing by the professional staff. The results are presented in a concise review format that simplifies the selection of systems based on business requirements. Related articles and commentary complement the reviews to provide a complete information service.

Annual subscription rate is $25. Contact Business Computing Press, P.O. Box 55056, Valencia, CA 91355.

CIRCLE INQUIRY NO. 305

Newsletter for Entrepreneurs

Datasearch Incorporated is now publishing "Computer Opportunities," a monthly newsletter of career ideas and strategies for the enterprising computer professional. Now in its 6th issue, it covers the most current and promising business opportunities such as consulting, software packages, contract programming, systems houses, dealerships, services, microcomputer enterprises, and much more.

It also reports on the turkeys — business ventures to stay away from, and loads of how-to-do-it information on starting and succeeding in your own computer business.

Some of its past articles have been "The Seminar Rip-off — Only $475 a head to hear Dr. Ivory; Why 98% of potential bank loan applications get show down; 2 out of 3 sales calls are made on the wrong people; How to protect your software when patenting and copyrighting don't fill the bill; Non-computing people seizing computer opportunities; $40-$50 an hour consulting jobs not always what they're cracked up to be."

Mailed monthly, yearly subscriptions are $36, with a 90-day (3-issue) cancellation privilege for complete immediate refund from Datasearch, Inc., 4954 William Arnold Rd., Memphis, TN 38117, (901) 761-9090.

CIRCLE INQUIRY NO. 306

Microsoft Basic by Ken Knecht

This book presents a complete introduction and tutorial on programming in BASIC. The concepts illustrated are presented with examples that actually run using the popular MITS family of BASIC interpreters.

This excellent course in BASIC programming requires only a beginner's understanding of computer fundamentals and access to a computer using one of the MITS BASIC language processors.

Price is $8.95, paper. Contact dilithium Press, P.O. Box 92, Forest Grove, OR 97116.

CIRCLE INQUIRY NO. 307

Book on 6502

Introduction to Microprocessor Systems Engineering by Camp, Smay and Triska is a 6502 book that will help you develop general microcomputer-based system design principles. A number of system design examples are presented.

Heavy emphasis is placed on the role of software development in the design process. Detailed instructions in the use of the Rockwell System 65 development system is provided

Contents include Introduction to microcomputer-based design, General aspects of microprocessor-based systems, The 6502 microprocessor and peripheral parts, Software aids, Introduction to 8080 Microprocessors.

Price is $19.95, cloth. Contact Matrix Publishers, 30 NW 23rd Pl., Portland, OR 97210.

CIRCLE INQUIRY NO. 308

Making Money With Your Microcomputer

This book, by Carl Townsend and Merl Miller, is basically a course in turning your microcomputer into a closed-loop economic system, in short, turning that computer into a moneymaker. Chock full of examples, this volume not only shows you how to program the services you are going to sell, but tells you how to sell them as well. Topics covered include how to start a service bureau, microcomputer repair and maintenance, selling software and establishing a business to name but a few. Also included are chapters on writing microcomputer books and articles for magazines.

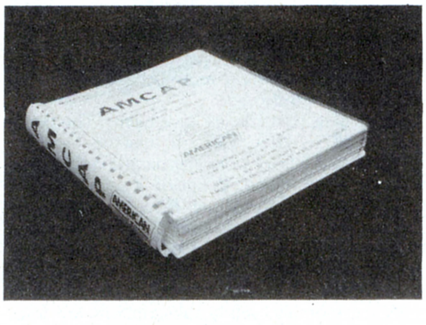
If you'd like to investigate the possibilities of having your microcomputer pay for itself and lots of peripherals or if you're considering going into business full time with your micro, this is the book that can save you a lot of legwork, research and mistakes before you make your decisions.

Price is $6.95 paper. Contact Robotics Press, P.O. Box 92, Forest Grove, OR 97116.

CIRCLE INQUIRY NO. 309

Accounting Package Manual

A 250-page manual describing the American Microprocessors Complete Accounting Package is now available from American Intelligent Machines. The manual describes how a low-cost microcomputer is used to automate everyday accounting and recordkeeping functions for small to medium sized businesses including divisions and/or departments. The manual includes dialog, descriptions and examples including printouts of General Ledger, statement of earnings, customer files, and many other business programs that are interactive and share a common integrated data base.



Price is $40. Contact American Intelligent Machines, AMCAP Dept., P.O. Box 48, 20 N. Milwaukee Ave., Prairie View, IL 60069, (312) 634-0076.

CIRCLE INQUIRY NO. 310

Computer Directory

Regional directories of computer installatins are available from C.I.I. Publications. Current, accurate information includes: type of equipment, languages, applications, time-for-sale, number of dp employees, and dp manager's name. Listings are organized alphabetically by state. Cross reference indexes list companies by equipment and industry. All information is verified by mail or telephone contact within a few months of the publishing date.

Prices range from $90 to $150. The 1979 editions will cover the Southeast, Midwest and Northeast. Contact C.I.I. Publications, 233 Peachtree St., Suite 2010, Atlanta, GA 30303, (404) 586-0143.

CIRCLE INQUIRY NO. 311

Brochure on Printer Controller

The only controller that makes the IBM printer available to any computer user is described in a brochure available from Spur Products Corporation. Operating advantages of the IBM 1403 printer and cost advantages of the Spur controller are also told in the illustrated brochure.

The combination of 1403 printer and Spur controller makes available the highest quality high-speed printing at the industry's lowest prices. An optional tester/exerciser for maintenance of the controller also is described.

For details contact Spur Products Corp., 1904 Centinela Ave., Los Angeles, CA 90025.

CIRCLE INQUIRY NO. 312

Tape Reader Brochure

A colorful 6-page brochure entitled "Machine Control" features EECO's extensive line of quality 2001 commercial/industrial punched paper tape readers.

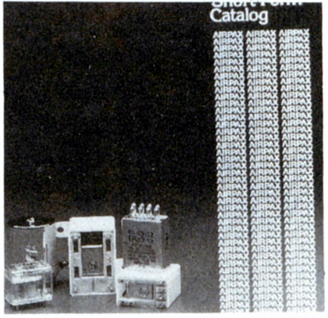
Included are descriptions of why punched tape is ideal for machine controls, present day applications, product definitions, a listing of sales representatives, and four-color photographs.

Contact EECO, 1601 E. Chestnut Ave., Santa Ana, CA 92701, (714) 835-6000.

CIRCLE INQUIRY NO. 313

Short Form Catalog

A short form catalog published by Airpax features general purpose, latching, and military relays. The 8-page publication also includes custom solenoids and coin acceptor/rejector switches for coin-operated vending machines.



The Airpax family of relays offers AC and DC models and both single and double pole configurations. For catalog or information contact Airpax/North American Philips Controls, Corp., Husky Park, Frederick, MD 21701, (301) 663-5141, Charlie Johnston.

CIRCLE INQUIRY NO. 314

General Ledger

General Ledger is the third in Osborne & Associates' series of BASIC business program books by Lon Poole and Mary Borchers. The book includes program listings with remarks, descriptions, discussion of the principles behind each program, file layouts, and a complete user's manual with step-by-step instructions, flow charts, and sample reports and CRT displays.

The program listings are in Wang Laboratories Extended BASIC. The book describes how these listings can be made compatible with other versions of BASIC.

General Ledger has been written to share common files with Osborne & Associates' two other books in the BASIC program series: *Payroll with Cost Accounting* and *Accounts Payable and Accounts Receivable*.

Price is $15, paperback. For details contact Osborne & Associates, Inc., P.O. Box 2036, Berkeley, CA 94702.

CIRCLE INQUIRY NO. 315

Service Directory

Associated Electronics Industry Services, Inc. has published the *Directory of Services for the Electronics Industry,* a reference manual which lists and describes the services of job shops, custom houses and consultants in Oregon. The listings are expanding into other geographical areas. The directory gives a one page, detailed description of the services provided by each company or consultant listed.

DIRECTORY OF SERVICES FOR THE ELECTRONICS INDUSTRY

Price is $12.50 and includes a 1-year subscription service for new and updated listings. Contact Associated Electronics Industry Services, Inc., 8740 S.W. Comanche Way, Tualatin, OR 97062.

CIRCLE INQUIRY NO. 316

Directory of Publications

Round Table Associates is now publishing *Computer Business* which is a monthly newsletter that cites over 125 key articles on computers, communications, and office automation, selected from more than 50 technical and business publications, and encapsulates them in non-technical language, stressing benefits, not techniques. Also available is the "1979 Directory of Computer and Communications Trade Publications" ($25) showing reprint ordering information.

The directory is offered free with prepaid one-year subscription ($48/year) to Computer Business. Contact Round Table Associates, P.O. Box 45923, Los Angeles, CA 90045, (213) 649-2846.

CIRCLE INQUIRY NO. 317

1979 EAC Directory

A comprehensive guide to many of California's high-technology growth companies and their products is now available from the Electronics Association of California (EAC).

The directory and product guide incorporates a unique cross-reference product guide that lists all member companies of the association under product categories for quick identification.

Other facts in the lising include how securities are traded, product sales information, and a summary of company products.

The directory also gives an outline of the services the EAC offers to its members. Price is $25. Contact Electronics Association of California, 795 Kifer Rd., Sunnyvale, CA 94086.

CIRCLE INQUIRY NO. 318

Ever Ready Label Catalog No. 20

From product identification and merchandising to factory and office systems, the new catalog contains hundreds of labels. Every Ready is continuously changing its line to keep up with the ever-increasing business pace.

EVER READY LABEL
Fast Communications

New items such as copier labels, are quickly adapted by large and small companies. And emphasizing their contribution to the speedy efficiency of computer systems, Ever Ready is offering a bonanza of bonus premiums to users of these data processing labels.

For more information contact Ever Ready Label Corp., 357 Cortlandt St., Belleville, NJ 07109, Morris Shaw.

CIRCLE INQUIRY NO. 319

TRS-80 Magazine

PROG/80 is a new magazine designed specifically to increase the skill of the serious programmer using the TRS-80 microcomputer. Among the features are tutorials on getting the most out of programming commands, using the ports and graphics of the TRS-80, programming ideas, hardware applications, Tandy developments, and other articles of interest to the serious hobbyist or beginning professional using the Radio Shack computer.

The magazine will be published at two to three month intervals. Subscription rate is $10 for four issues. Contact PROG/80, P.O. Box 68, Milford, NH 03055, (603) 673-5144.

CIRCLE INQUIRY NO. 320

Computers in Psychiatry/Psychology

Computers in Psychiatry/Psychology (formerly Micro-Psych), a bimonthly newsletter for professionals interested in the use of computers in psychiatry and clinical psychology, is beginning its second year of publication. Addressing itself in an informal, scientific style to clinical users of the computer, it has attracted over 300 subscribers, most of whom are using or planning to use computers in their work.

Three pages of each issue are devoted to a description of the computer related activities of subscribers, offering many readers their first opportunity to discover otehrs who share their interests and enthusiasm. The equipment they use varies in size from micros to multi-state mega systems.

Each issue of the 13-page newsletter contains summaries and reviews of recently published articles and books as well as an on-going bibiography and a program catalog.

Subscription price is $15. Contact Computers in Psychiatry/Psychology, 26 Trumbull St., New Haven, CT 06511.

CIRCLE INQUIRY NO. 321

Circular Connectors Catalog

ITT Cannon Electric has produced a revised 54-page catalog on standard circular connectors designed to MIL-C-5015.

The catalog has 51 photos, some eight dozen drawings and a large store of information covering shell sizes, contact arrangements, electrical service data, thermocouple contacts, wiring, high potential test voltage and a number of charts and cross-sections.

Contact ITT Cannon Electric, 666 E. Dyer Rd., Santa Ana, CA 92702, (714) 557-4700, Richard Harmon.

CIRCLE INQUIRY NO. 322

Free-Lance Software Publishing

This 100-page soft-cover book is written specifically for the independent software writer. It presents all the modern techniques presently being used by large corporations, as well as individuals, to advertise, market, license and maintain proprietary computer software.

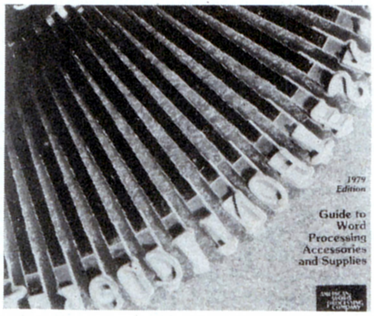
Included are such topics as selling major software packages directly to end users; installing programs on service bureaus; selling low cost software for personal computers; publishing software in book form; and setting up a program user's group. Also included are valuable tips to help the independent writer when negotiating with large corporations.

Price is $10. Contact Kern Publications, Box H211, Littleton, MA 01460.

CIRCLE INQUIRY NO. 323

Free "Guide to Word Processing Accessories and Supplies"

An 84-page illustrated guide, this book describes almost 1,300 items for word and data processing installations and is available from American Word Processing Company.



Included are many new diskette and mini-diskette storage systems, anti-static mats, CRT work stations, competitive brands of Diablo and Qume ribbons, two new lines of durable plastic printwheels and much, much more.

Contact American Word Processing Co., 18730 Oxnard St., Tarzana, CA 91356, (213) 705-2245.

CIRCLE INQUIRY NO. 324

Signal Processing Equipment Brochure

A free 12-page full-color capabilities brochure from Signal Processing Systems demonstrates total solutions to the ever increasing variety of problems, for which signal processing can be used.

Your Total Signal Processing Company

A special section of the brochure describes the unique architecture of SPS high speed programmable special-purpose digital computers. Charts, photos and software descriptions are also included.

Contact Signal Processing Systems, Inc., Dept. B, 223 Crescent St., Waltham, MA 02154.

CIRCLE INQUIRY NO. 325

Data Entry Equipment Research Study

A marketing research on the subject of data entry is currently underway at Impact Marketing Services, a DP industry marketing consulting and marketing research organization.

The broad-based study is aimed at determining the attitudes, perceived product/vendor requirements and purchase intentions for data entry equipment among users and managers of such equipment and services in several commercial/industrial sectors of the nation's economy.

Over 500 firms are being included in the initial survey sample. Survey questions will focus on determining data entry plans and expectatins among user organizations for the 1979-1983 period.

Data Entry: Users Prepare for the 1980's is priced at $350. For details contact Impact Marketing Services, 10318 Globe Ct., Ellicott City, MD 21043, (301) 465-7037.

CIRCLE INQUIRY NO. 326

Guide to Computer Selection

A "Correlation Guide to Desktop Computer Selection" identifies hardware/software characteristics of over a dozen popular desktop computers, provides a ready reference for comparing various portable desktop system capabilities, and serves as a basis for determining systems compatibility to aid in the development of more flexible, transportable software. The guide includes a general description of each manufacturer's product line and appropriate comparisons with the system lines offered by competitors.

The systems described in detail include the TRS-80, Apple II, IBM 5110, and the Hewlett-Packard 9800, Tektronix 4050, and Wang 2200 series desktop computers.

A glossary of hardware and software terms and characteristics is provided to both clarify and educate the users in the terminology associated with desktop computers.

Price is $14.95. Contact Atlantic Analysis Corp., 5 Koger Executive Ctr., Suite 219, Norfolk, VA 23502.

CIRCLE INQUIRY NO. 327

Small-Signal Transistors Catalog

A new four-page short-form catalog, from Solid State Devices, lists fifty small-signal silicon transistors. Separate sections list general-purpose devices, radio-frequency amplifiers, high-gain amplifiers and oscillators, NPN and PNP complementary pairs, medium-speed switch-drivers and ultra-high speed devices. Several are hard to find JEDEC 2N numbers.

For details contact Solid State Devices, Inc., 14830 Valley View Ave., La Mirada, CA 90638, (213) 921-9660.

CIRCLE INQUIRY NO. 328

Instrumental Rental Catalog

A handy ready reference to more than 15,000 test instruments, representing many major manufacturers, is now available free from General Electric Company.

Indexed for ease of reference by equipment function as well as by manufacturer, the 52-page catalog includes pertinent data on the rental equipment as well as a listing of General Electric nationwide Rental Sales/Service Shops.

General Electric offers weekly or monthly rental plans for individual instruments or complete measurement systems, with quick delivery from eight computer-linked stocking inventory centers. Application assistance is also available nationwide.

For a free copy contact General Electric Co., Apparatus Service Div., Bldg. 4, Room 210, One River Rd., Schenectady, NY 12345, (518) 372-9900.

CIRCLE INQUIRY NO. 329

Markline Spring '79 Catalog

This catalog enables engineers and other busy professionals to do all their calculator shopping from the convenience of their office and their home by using Markline's toll-free phone number.

The 36-page catalog features 14 pages of calculators, 5 pages of electronic games. Also shown are security devices, translators, clocks, office products, telephones and radios. The manufacturers of these products are well known in the electronic industry.

For information on obtaining a free copy contact Markline Co., Inc., Catalog, P.O. Box 1750, Waltham, MA 02154, (800) 225-8493.

CIRCLE INQUIRY NO. 330

Free Computer Newsletter

B. Cross Associates has available *Crosswords*, a periodic newsletter highlighting tools and techniques in selling software, data services and turnkey systems. Any company engaged in the development, sale and support of computer based products and services should look to Crosswords for helpful hints, insights to trends, results of experiments, and in general, the successes and failures associated with marketing in a highly competitive marketplace.

Subscription to Crosswords is free of charge. For more information contact Editor, Crosswords, c/o B. Cross Associates, Suite 530, 9000 Keystone Crossing, Indianapolis, IN 46240, (317) 844-2010.

CIRCLE INQUIRY NO. 331

Final Report on Workshop

The final report of the 12th Annual Data and Configuration Management Workshop held last October by the Electronic Industries Association is now available.

The report features the keynote address by Lt. Gen. R.T. Marsh (USAF), Commander, Electronic Systems Division (AFSC), on "The Impact of Today's Galloping Electronic Technology on Systems Acquisition." It includes the reports of the seven workshop panels on: Source Selection and Contractor Systems Definition for CM, DM, QA; Tailoring Implementation; Technology Transfer; Acquisition Management and Data Requirements Control; Software Requirements Baselining and Control; Military Computer Family (MCF) Program Objective and Approach, and Management of Microprocessors.

Price is $10 for members and $15 for all others. For more information contact Electronic Industries Association, 2001 Eye St. N.W., Washington, D.C. 20006.

CIRCLE INQUIRY NO. 332

Software Production Guide

To help reduce the risks caused by computer errors in business, a report "Improving EDP Software Production," provides guidelines for effective project management and quality control in developing, installing and maintaining computer programs.

Directed at managers responsible for software projects, the report outlines typical problems in development, and offers guidance on design and development, testing, maintenance, documentation and the use of software production tools.

Price is $5. Contact Reymont Associates, 29 Reymont Ave., Rye, NY 10580.

CIRCLE INQUIRY NO. 333

SOFTWARE

OASIS Operating System

The OASIS high performance multi-tasking operating system is now available in single and multi-user versions. Users and manufactuers of Z80, 8080 and 16-bit based microcomputers can realize significant dividends in performance and throughput with OASIS by optimized disk I/O and many other high performance enhancements.

Outstanding features are: Keyed Index Files (ISAM), Communications package, Hard Disk drivers, versatile Text Editor, Word Processor, FORTRAN, COBOL and BASIC languages, Print Spooler, Job Control language, Macro relocating Assembler, dynamic Debugger, user accounting, logon and password protection, and many other utilities and features.

An extensive Business System package including General Ledger, Accounts Receivable, Accounts Payable, Inventory, Mailing Label and other software is also available.

For more information contact Phase One Systems, Inc. 7700 Edgewater Dr., #710, Oakland, CA 94621, (415) 562-8085.

CIRCLE INQUIRY NO. 334

Accounting Software

A General Accounting System for the MICROSTAR Small Business System has been announced by Micro V Corporation. It includes General Ledger, Accounts Receivable, Accounts Payable, Payroll, Mail List and Word Processor.

A typical Microstar System supports two video display terminals, a line printer, 64K bytes RAM, 2.05 megabytes or 4.1 megabytes of disk storage and a line printer. Microstar dealers assembly a complete system for $6,500 to $7,500 including a desk console. End user price range is $9,500 to $14,000. For details contact Micro V, 17777 S.E. Main St., Irvine, CA 92714, (714) 957-1517.

CIRCLE INQUIRY NO. 335

Man Machine Interface

Paysoft features modular program architecture, high performance man/machine interface, and optimized "mix-and-match" data base architecture using both sequential and random accessing techniques. This system has been constructed seriously with serious high performance in mind.

Modular program architecture applies its inherent strength to streamline operations. High performance man/machine interface means the operator does little — the machine does a lot.

The man/machine interface has been carefully engineered to acquire data from the operator in a language known to the businessman, not the programmer. To speed data entry and minimize operator error, the operator sees only one input request at a time displayed in large characters (double size — 32 characters per line).

The Ready Corporation has established a comprehensive software maintenance policy for Paysoft as well as our other software systems. Price for Paysoft diskette and manual is $125. For details contact Ready Corp., P.O. Box 532, Pleasanton, CA 94566, (415) 462-4381.

CIRCLE INQUIRY NO. 336

Pascal O/S

Pickles & Trout has available two software packages for the UCSD Pascal operating system. The first package, FORMOUT, is a collection of routines to do formatted output from Pascal programs. FORMOUT relieves the programmer of the burden of creating routines to make the pretty output he wants from his program.

CPMREAD, the second package, translates CP/M disk files to Pascal text files. It allows the user to investigate the CP/M disk directory and choose the files to be translated. Now that precious database can be transferred to Pascal to make use of the power of Pascal for further programming.

FORMOUT is available as a source listing with manual for $20. CPMREAD is distributed as an executable code file only for $25. For details contact Pickles & Trout, P.O. Box 1206, Goleta, CA 93017, (805) 967-9563.

CIRCLE INQUIRY NO. 337

Checkers for Apple

Lon Rater Software has developed Autocheckers for the Apple II computer. Because Autocheckers contains numerous 6502 machine language subroutines it can play a challenging and enjoyable game of checkers. Any of seven levels of difficulty may be selected.

When playing at the default level Autocheckers will look ahead a full six moves before selecting a play. At this level the computer usually responds in less than 10 seconds and rarely requires more than 20 seconds.

Playing at the highest difficulty level the program will look eight moves ahead before moving, typically in about 70 seconds. If one of the lower levels of difficulty is chosen, Autocheckers will play in about two seconds and offer the beginner an appropriate challenge.

Requires 16K bytes. Price is $19.95 on cassette tape with instructions. For details contact Lon Rater Software, P.O. Box 57007, Webster, TX 77598.

CIRCLE INQUIRY NO. 338

A/R for Micropolis

Small Business Computer Service has Accounts Receivable and Accounts Payable systems to offer on the Micropolis Mod II disk system. The accounts receivable system will provide you with complete billings, both invoice and statements. Other reports produced are aged accounts receivable report, period sales summary, customer payments summary, commission sales report, and customer file report. This system features auto dunning as part of the statements program and sales tax calculations.

The accounts payable system features completely random access files, and the reports generated are the amounts owed to each vendor, summary by general ledger account number, vendor list and aged payables. Also produced is the paid bills report.

Both packages are well documented and sell for $150 each or $250 for both. For details contact Small Business Computer Service, 813 MacArthur Dr., Urbana, IL 61801.

CIRCLE INQUIRY NO. 339

8080/Z80 Word Processing

TEXTWRITER II is a word processing program that can be used to print files created by an editing program. Form letters can be printed from a mailing list file and personalized with automatic name and address insertion. Contracts, specifications, or other documents can be printed from a user defined library of standard paragraphs.

TEXTWRITER II is written in 8080 assembly language in order to drive high speed printers. Versions are available in CP/M on 8" IBM format or 5¼" Micropolis, North Star and TRS-80 diskettes; Micropolis MDOS; and North Star DOS. Price is $75 for a diskette and user's manual. Manual alone $10. For details contact Organic Software, 1492 Windsor Way, Livermore, CA 94550, (415) 455-4034.

CIRCLE INQUIRY NO. 340

M6800 System Relocatable Recursive Macroassembler and Linking Loader

RRMAC allows unlimited character replacement in any field of a macro model statement. RRMAC's argument notation can specify replacement from any field, subfield, sublist or substring of the macro call statement. RRMAC's set of macro directions supports both global and local set symbols. Set symbols can be either arithmetic or character. Conditional assembly can be based on either arithmetic or character expressions.

Macro model statements can determine attributes of set symbols or macro arguments. RRMAC allows macros to define new macros, macros to call other macros and macro calls can be recursive, that is, a macro may call itself.

Price is $150. For details contact Software Works, 330 Camino De Las Colinas, Redondo Beach, CA 90277.

CIRCLE INQUIRY NO. 341

APPLE-80

APPLE-80 is an 8080 simulator and debug package designed for the Apple II 6502-based computer. Any 16K or larger Apple II can run programs written for the 8080 and can be used as a design and debugging aid for the development of original 8080 software.

APPLE-80 provides single-step, trace and run modes and executes all valid 8080 op-codes. Illegal op-codes are rejected. All 8080 registers are visible on the Apple screen and may be modified at will. 8080 I/O port addresses are arranged in a table for each of user modification. Up to 8 breakpoints may be set to facilitate program debugging.

Price is $20 plus $1.50 S&H. For details contact Dann McCreary, Box 16435-I, San Diego, CA 92116.

CIRCLE INQUIRY NO. 342

'Big Four' Programs

Graham-Dorian Software Systems has added four new software programs — Accounts Receivable, Accounts Payable, General Ledger, and Job Costing — to its full line of computer software.

ACCOUNTS PAYABLE
ACCOUNTS RECEIVABLE
GENERAL LEDGER
JOB COSTING

The new programs tie together, so the user can start with one and add others as desired. Their on-line capabilities enable an operator to make a single entry and update all affected files.

For details contact Graham-Dorian Enterprises, c/o Sullivan Higdon Inc., 315 S. Ellis, Wichita, KS 67211, (316) 265-8633, Wm. Graham, Jr.

CIRCLE INQUIRY NO. 344

G/L Software

MAXILEDGER is a General Ledger software package that allows for 7,200 user-definable accounts, 800 subtotals and 1,000 user programmable special accounts. Automatic Double Entry checks at input time whether the accounting equation is satisfied. Up to 500 transactions may be posted at a time.

Current, month-to-date and year-to-date columns are reported. A special routine allows the conversion of existing MICROLEDGER charts of accounts into MAXILEDGER charts of accounts. MAXILEDGER runs on any 8080 or Z80 microcomputer that uses a Micropolis 1053 Model II drive.

Price is $280. For details contact CompuMax Associates, Inc., 505 Hamilton Ave., Palo Alto, CA 94301, (415) 321-2881.

CIRCLE INQUIRY NO. 345

SASSY

SASSY is a proprietary 8080 Assembler, designed to be completely CP/M compatible and contains extended capabilities not previously available for CP/M systems.

SASSY supports multiple file operation, allowing any number of source files, resident on up to four drives, to be linked together to form a single complete program. List/No List directives have been included, as have complete symbol and cross reference tables. Also included are page width and length directives. Industry standard mnemonics and format are fully supported.

Price is $75. For details contact Midwest Micro-Tek, Inc., P.O. Box 29411, Brooklyn Center, MN 55429, (612) 560-6530.

CIRCLE INQUIRY NO. 346

Inventory Control/Cash Register

POINT OF SALE™ is an inventory control and cash register software package for the Apple II. This comprehensive packages provides a convenient, error free means of handling inventory, invoicing, backorders, sales and cash.

While operating much like a cash register, the system maintains data on inventory level, reorder points, inventory cost and wholesale & retail value.

Price is $500. For details contact High Technology, 1611 NW 23rd St., Oklahoma City, OK 73106, (405) 528-8008.

CIRCLE INQUIRY NO. 347

MCOS Update Announcement

Micro Com, Inc. has released version 1.01 of the MCOS disk operating system. Version 1.01 represents a major revision of the operating system and supporting utility programs. Also, additional programs have been added to the standard operating system package which add versatility and program development capabilities.

MCOS version 1.01 offers the following enhanced and added features: full CP/M compatability and CPM/MCOS/CPM conversion utilities; Zilog mnemonic disk assembler; Z-80 machine language debug program with disk and cassette I/O; Full file attribute assignments (read protection, write protection, permanent files, etc.); faster response to user requests, and more.

Provision has been made for labeling disks and for specifying directories with more than 64 file entries. The label utilty allows setting or reading the label contents.

Price is $125. For more information contact Micro Com, Inc., 1261 SW 11th Ave., Deerfield Beach, FL 33441.

CIRCLE INQUIRY NO. 348

TSC BASIC for the 6800

The program resides in 9.5K of memory and supports all of the standard BASIC statements and functions as well as many extended capabilities. Both floating point and string variables are provided with strings being fully dynamic and unrestricted in size. Variable names may be either the standard types or double letter combinatinos allowing limited variable name mnemonics.

TSC BASIC is a very fast and powerful BASIC. It is easily adapted to run in any 6800 system having at least 12K of user RAM available from location 0000. Price is $39.95. For details contact Technical Systems Consultants, Inc., Box 2574, W. Lafayette, IN 47906, (317) 463-2502.

CIRCLE INQUIRY NO. 349

Text Editor/Word Processing System

MARYELLN is a text editor/word processing system available for the North Star disk that contains the best features of the North Star BASIC editor, string handling features of large computer editors, and word processing capability.

There are 29 commands including AUTO, DELETE, RENUMBER, SCRATCH, LOAD, SAVE, NULL, EDIT, LIST, NSAVE, APPEND, and QUIT similar to those commands in North Star BASIC. String handling commands include FIND, CHANGE, CHANGE ALL, MOVE, and COPY. These commands allow you to find and change characters or phrases, or move and copy entire lines of text at memory speed.

Word processing commands include OPEN, TITLE, LINE, SPACE, UNIT, PAGE, JUSTIFY, REPEAT and PRINT. Line fill, right justification, centering, automatic insert, titles, page numbering, and forms control are done under the PRINT command.

Price with documentation is $38. Contact Surf Computer Services, P.O. Box 3218-B, N. Hollywood, CA 91606.

CIRCLE INQUIRY NO. 350

Advertising Software for Apple II

"The Scrolling Wonder" allows four brief flashing slogans to pop up randomly from the bottom of the screen.

"Giant Letters" allows brilliantly-colored, full-screen sized letters to be flashed on the screen consecutively, until a message is spelled out. A running summary of the message is presented in standard Apple characters beneath the giant letters, to help viewers keep track of the letter sequence.

"Hi-Res Alphanumeric Message" allows four lines of crisp characters, 28/line, each character ⅛ screen height to be "puffed" on at comfortable reading speed, to form a message. When 4 lines are filled, a page dissolve occurs and another page can be filled. Capacity is three pages; the message can be made to linger or repeat.

Price is $25 for all three. For details contact Connecticut Information Systems Co., 218 Huntington Rd., Bridgeport, CT 06608.

CIRCLE INQUIRY NO. 351

Utilities Package for Alpha Micro

Alpha Programmer's Utilities Package consists of 5 Alpha Basic programs and 5 assembly language subroutines each with source code, object code and documentation.

The package includes a very fast cross reference program (10 blocks of Alpha Basic source code per minutes). A renumber, denumber and add number program is also included. Another program can be used to transfer large disk files to and from (multiple) floppy disks.

Price is $35 on floppy disk and $125 on Hawk cartridge. Contact The Real Oregon Computer Co., 207 W. 10th, Eugene, OR 97401, (503) 484-1040.

CIRCLE INQUIRY NO. 352

CPA Financial Statement System

Financial statements are produced by a specialized report generator which uses an instruction file and a general ledger file. In addition to the normal balance sheet and income statement, the statements may include a statement of changes in financial position, statement of retained earnings, supporting statements and schedules, footnotes and opinion.

Some automatic handling of accrual information is performed. All statements are fully user defined. Runs on Alpha Micro and 48K of memory.

Price is $500 for source code. Contact Payne, Jackson and Associates, 611 W. 9th Ave., Anchorage, AK 99501, (907) 272-7261.

CIRCLE INQUIRY NO. 353

ROM Software Library

Programmer's Aid # is the first of a series of software packages from Apple Computer designed to improve and amplify user programming techniques.

The Programmer's Aid Package is a ROM based library of routines whose capabilities include high resolution graphics, program renumbering and linking, tape verification, tone generation, RAM testing and machine language program relocation.

PROGRAMMER'S AID #1
INSTALLATION AND OPERATING MANUAL
Apple Utility Programs

The Programmer's Aid routines are designed for use with the Apple II computer's integer version of BASIC.

Price is $50. For details contact Apple Computer, Inc., 10260 Bandley Dr., Cupertino, CA 95014.

CIRCLE INQUIRY NO. 354

Program for Winning Blackjack

WIN21 is a practice and tutorial program for winning casino blackjack. Written in BASIC for the TRS-80 (16K Level II), the program drills the user in any of four different strategies from Edward Thorp's bestseller, *Beat the Dealer.* It does this by simulating actual casino play and coaching the user at every decision point from betting to insuring, pair splitting, doubling down, and drawing.

The user is given a wide range of options regarding rules variations and the level of coaching received. By answering a series of questions flashed on the screen, the program can be configured to play by itself, give instructions, correct mistakes or ignore them entirely.

Price is $29 on cassette with a copy of *Beat the Dealer* and a user's manual tying the program to the book through a series of lessons. For details contact Discovery Bay Software Co., P.O. Box 464, Port Townsend, WA 98368.

CIRCLE INQUIRY NO. 355

Financial Programs

Rothenberg Information Systems, Inc. announces a price breakthrough for quality financial programs. They have completed initial deliveries of all five modules of their Integrated Financial Programs. Those five modules (General Ledger, Accounts Receivable, Accounts Payable, Payroll, and Inventory Control) provide the small and medium-sized business complete control of its financial information.

All of the programs make extensive use of menus to prompt the operator. Accounting knowledge is not required to make good use of these programs.

The programs operate on any 8080 or Z-80 floppy disk system that supports the CP/M operating system. Available under license for a single CPU for $500 per module. Manuals including file layouts and sample reports are available for $8 per module.

For details contact Rothenberg Information Systems, Inc., 260 Sheridan Ave., Palo Alto, CA 94306, (415) 324-8850.

CIRCLE INQUIRY NO. 356

ROM BASIC

The innovative ROM SQuared version lets you execute your application program just by turning on your 8080, 8085 or Z-80. There's no longer any need to maintain and store floppy disks or cassettes in hostile environments.

XYBASIC
PROGRAMMING MANUAL

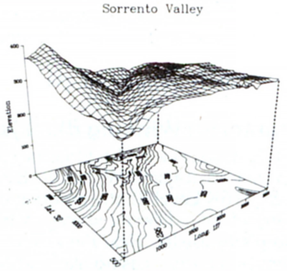
Versions are available for all 8080-based systems. Other features include the added flexibility that a patchable I/O provides.

Price for ROM SQuared XYBASIC starts at $295. Programming manual $20. For details contact Mark Williams Co., 1430 W. Wrightwood Ave., Chicago, IL 60614.

CIRCLE INQUIRY NO. 357

Computer Graphics

A new version of DISSPLA computer graphics software system features two major new options: contouring and business graphics capabilities. Another significant feature of DISSPLA is Extended Device Interfacing, which makes maximum use of intelligent terminals in order to improve efficiency, speed and quality. DISSPLA is a device-independent, integrated software system of FORTRAN subroutines which are called up by the user's program to produce a wide range of publication-quality 2- and 3-dimensional graphics.



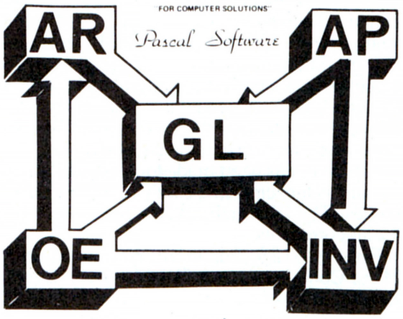
The Business Features option is a collection of capabilities geared to financial and administrative applications.

For details contact Integrated Software Systems Corp., 4186 Sorrento Valley Blvd., Suite G, San Diego, CA 92121, (714) 452-0170.

CIRCLE INQUIRY NO. 358

Pascal Business Package

P.S., inc., has announced a fully integrated system of Pascal business accounting packages. The software includes a general ledger package that permits a company to name and number over 1,000 of its own accounts and to generate financial reports for the over-all operation and for separate profit centers, if any.



Accounts Payable, with aging and cash requirements reporting; Accounts Receivable, with aging and sales analysis; Order Entry and Inventory Control are all tied into the general ledger.

For details contact P.S., inc., 619 N P Ave., Fargo, ND 58102, (701) 235-8145, Dan Kary.

CIRCLE INQUIRY NO. 359

Standard Tax Program

Includes Federal 1040 pages 1 and 2, Federal 1040A, Schedules A, B, C, D, E, F, G, R, RP, SE, TC; Forms 2106, 2441; sales tax tables (state of choice), Tax tables A, B, C, D and tax schedules X, Y, Z, and instruction manual.

Requires 19K free memory, one disk, available on North Star BASIC or CP/M, screen formatting using line by line prompts, output on tractor feed (CTS provides pin feed forms) or friction feed (uses standard IRS forms).

Features 1% and 3% medical limitation incorporated, auto check for FICA over-withholding, auto earned income credit, audo dividend exclusion, types tax preparer's federal ID and ssn, and more.

Price is $395. For details contact CP Aids, Div. of Computer Tax Service inc., 1640 Franklin Ave., Kent, OH 44240, (216) 678-9015.

CIRCLE INQUIRY NO. 360

Educational Software

Memory Builder, Story Builder, and *Code Breaker* are three new educational games now available from Program Design, Inc. for the Apple, PET, or TRS-80 Level II.

Memory Builder is a Concentration-type game that helps improve memory and attention span. Story Builder writes short stories with the child to help improve grammar and vocabulary. Code Breaker gives scrambled messages for players to decode; improves basic writing skills. (Code Breaker not available for TRS-80).

Morse Code Game for the PET only turns the PET into a Morse Code sounder and gives players practice in transcribing messages.

All courses $13.50 from Program Design, Inc., 11 Idar Ct., Greenwich, CT 06830 or dealers. All tapes guaranteed to run.

CIRCLE INQUIRY NO. 361

CP/68™

CP/68 is a powerful disk-based operating system for 6800s. A combination of memory-resident and transient commands provide the system's flexibility.

The user can even add his own commands to the system. PIP, the Peripheral Interchange Program allow transfer of data between physical devices. Wildcard operation of all disk comands lets you specify files either ambiguously or unambiguously.

For more information contact Hemenway Associates, Inc., 101 Tremont St., Suite 208, Boston, MA 02108, (617) 426-1931.

CIRCLE INQUIRY NO. 362

CP/M Word Processor

WORD-STAR is a completely integrated word processing software package that turns any 8080/8085/Z80 microcomputer into a word processing machine with features like dynamic on-screen text composition. You will see exactly what will print as it is being entered. Complete with right and left margins, page breaks, centering, etc.

Other features include ease of operator training through dynamically activated menus which allow a new operator to become productive immediately. Installation dialog configures Word-Star to most popular terminals and/or video boards. Word-Star will run on any 32K micro running CP/M or its derivatives, with any terminal possessing an addressable cursor.

For details contact MicroPro International Corp., 1299 4th St., San Rafael, CA 94901, (415) 457-8990, Fred Pood.

CIRCLE INQUIRY NO. 363

Hybrid Development System

HDS includes an interactive assembler/editor located at 40H to be co-resident with BASIC, together with modifications to North Star BASIC which facilitate communications between BASIC and assembly routines.

The modifications to BASIC give access to the addresses of BASIC variables and extend the CALL function of BASIC to allow an unlimited parameter list. Access to the address of a BASIC variable is gained by enclosing the variable in square brackets. Thus A1 refers to the value of the variable A1 while [A1] refers to the location of A1. Now assembly routines can use BASIC variables or strings and return results back to BASIC.

HDS requires at least 24K memory starting at 0H. Modifications are available for standard (8-digit) North Star BASIC Release 4.0 and 5.0. Price is $40 on 5" diskette with documentation. For details contact Allen Ashley, 395 Sierra Madre Villa, Pasadena, CA 91107, (213) 793-5748.

CIRCLE INQUIRY NO. 364

Upgraded 6800 Software

SD announces the release of BASIC Compiler V1.4, V1.5; ASM V1.3; and EDIT V1.1 for 6800 microprocessors.

BASIC V1.4 adds line labels, smaller and faster compiled code to the features of V1.3, which included integer and 10 digit decimal floating point, file I/O, 15 letter variable names, string operations, IF-THEN-ELSE, assembly language calls and many other features suited for business or control applications.

ASM V1.3 is an upgrade of ASM V1.2, a 6800 assembler, and has been enhanced to handle the 6801, 6802 and 6803 instruction sets.

EDIT V1.1 is an upgrade of the SD text editor and gives English error diagnostics and a facility to aid beginners in learning its use.

BASIC V1.5, ASM V1.3, and EDIT V1.1 have been optimized for execution under SDOS, SD's 6800 Disk Operating System, to take better advantage of the random file access and optimized disk transfers provided by the system.

For details contact Software Dynamics, 2111 W. Crescent, Suite G, Anaheim, CA 92801, (714) 635-4760.

CIRCLE INQUIRY NO. 365

TRS-80 Forecasting Package

This disk-based package contains a set of forecasting programs which will allow the small business user to solve a variety of business forecasting needs.

Included in the package is an advanced version of multiple regression along with a seasonal adjustment program and another forecasting program. The data preparation program allows the creation, modification and deletion of disk-based data sets. The data sets are accessible by all programs.

For details contact Applied Economic Analysis, 4005 Locust Ave., Long Beach, CA 90807, (213) 424-3652.

CIRCLE INQUIRY NO. 366

Command Processor

COMPROC extends the DOS-AUTO command to perform multiple steps either at power-up or as a single user system command. Running of an application program is now made simple and automatic.

The script executed by COMPROC consists of a sequence of commands or data (such as VERIFY, DIR, BASIC, LOAD, RUN, etc.). This script is easily created, changed and saved using the AUTO/EDIT/SAVE facilities of BASIC.

Additional enhanced features available include optional self-relocating key-DEBOUNCE routine; user specified fields may be inserted automatically in the users script when COMPROC is executed; COMPROC pauses to allow the user to enter data at specified locations at execution-time; runs in any size TRS-80 system.

For details contact Racet Computes, 702 Palmdale, Orange, CA 92665.

CIRCLE INQUIRY NO. 367

MailMaster®

MailMaster is a software package to simplify processing and management of mail lists for use with Processor Technology's Sol computer. Using a disk as the memory medium, the program provides storage of up to 5095 names, addresses and other data in a single list. Each entry can consist of up to 1,000 characters distributed among a maximum of 99 lines.

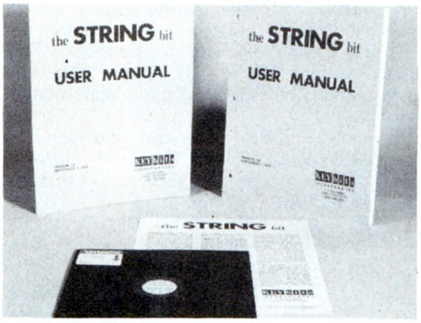
Entries may be added, deleted, or updated very rapidly and simply. No sorting is necessary. Print mailing labels automatically for all names on the list or a selected group. Inputs for automatic addressing machines used in bulk mailings can be prepared. Personalize form letters and print them out automatically when the program is used with Processor Technology's WordWizard Electronic Typing System.

Suggested price is $395. For details contact Processor Technology, Inc., 7100 Johnson Dr., Pleasanton, CA 94566.

CIRCLE INQUIRY NO. 368

Bit Library

The STRING Bit™ is a collection of FORTRAN character string handling routines. In addition to the very complete library of string handling routines, The STRING Bit includes a library of custom routines that can be expanded by the user.



These two libraries are complemented by an interactive demonstration program to exercise all of the routines and thus demonstrate each routine's capabilities and limitations — dynamically.

Price is $45 on CP/M compatible floppy disk. For details contact Key Bits, Inc., P.O. Box 592293, Miami, FL 33159.

CIRCLE INQUIRY NO. 369

Software for Insurance Agents

The 'CRS' system is a complete, on-line client record system for the independent insurance agent written in North Star BASIC, and requiring at least 40K RAM. CRS allows for rapid information retrieval on a client, modification, deletion and complete file maintenance. The user can store all pertinent information about a client including name, address, phone, salesman number, client number, up to six policies and the companies supplying the coverages, the premium and more.

Price is $250 on North Star diskette. For details contact Supersoft, P.O. Box 1628, Champaign, IL 61820.

CIRCLE INQUIRY NO. 370

APPLESHIFT

A package containing instructions for hardware modification of your Apple keyboard, machine language subroutines for input and screen display (lower case letters appear on your screen as upper case letters in normal mode; lower case letters appear as upper case letters in inverse mode) and an INTEGER BASIC demonstration program called TEXTPAGE.

TEXTPAGE allows you to enter, edit, store on disk, and print (using your own driver) 55 lines of 80 characters. Disk TEXTPAGE requires a DOS system with at least 24K. Tape version (available with listings only, no tape) needs 16K.

Price is $29.95. For details contact C&H Micro, P.O. Box 2161, Glen Ellyn, IL 60137.

CIRCLE INQUIRY NO. 371

Interactive Data Manager for TRS-80

IDM-III for the TRS-80 DOS system provides a general purpose, interactive, simple but powerful solution to database management. IDM-III allows many applications to be computerized without any programming. The basic components of IDM-III are data base initialization, data base manipulation, report-formatter and report-generator. The program requires 32K memory.

Sequential and random accesses are both supported. Randomly access a record by specifying a key or a record number. Features hashing, blocking and buffering technique.

Price is $49. For details contact Micro Architect, 96 Dothan St., Arlington, MA 02174.

CIRCLE INQUIRY NO. 372

File Access

Software Systems Consulting Incorporated has developed a multi-user file access system for the Alpha Micro computer. This system, which works within the AMOS operating system, allows all users simultaneous access to a common database file while providing record interlocking to prevent

TRS-80
PERIPHERALS & SUPPLIES

DISK DRIVES $399.00
Fully compatible with Radio Shack drives. Includes: ■ Power supply ■ silver case ■ 4 drive connector cable ■ verbatim diskette with test program and user op. system ■ 60 day warranty ■ complete user instructions.

16K RAM SETS $80.00
200NS 16K Dynamic RAM Memory Kit. NEC chips. Includes jumpers and instructions for installing in TRS-80 keyboard unit or expansion interface. (Specify keyboard or interface.)

VERBATIM DISKETTES $3.30 ea. 10 FOR $30.00
These are the top of the line in diskettes and worth every cent of the $6.00 each that you pay elsewhere.
Library cases also available.

CENTRONICS-779 LINE PRINTER $1200.00
With forms tractor. This is the same printer that Radio Shack supplies. A 399.00 savings if you buy from us.

TI-810 PRINTER $1595.00
All set to run on your TRS-80 at twice the speed of the 779.

Send to P.P.S.
P.O. Box 2051, Seal Beach, California 90740
For fast service or information call (714) 894-3736
We Accept Mastercharge and B of A
Dealer Inquiries Invited

CIRCLE INQUIRY NO. 78

concurrent updating of the same record by more than one user.

Although currently implemented as a single-volume variable-length ISAM file, there are easy and obvious extensions that allow this system to handle multi-volume disk files as well as file organization other than ISAM.

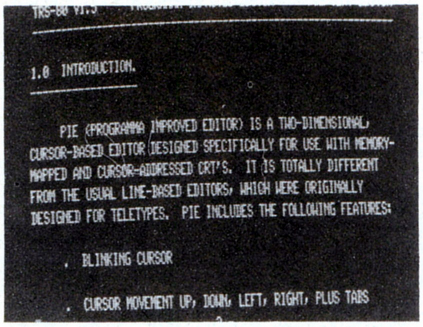
This file access method requires only 700 bytes of system memory and a single 16K-byte user area somewhere in memory.

Price is $500. For details contact Software Systems Consulting Inc., 2701 Spring Grove Ave., Cincinnati, OH 45225, Robert Strunk.

CIRCLE INQUIRY NO. 373

Programma Improved Editor

The PIE 2-dimensional, cursor-based text editor is designed to operate on the TRS-80 Level II (16K) and Sphere 6800 systems. The program generates cassette tapes which are compatible with the TRS-80 Editor/Assembler.



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TRS-80 V1.5

1.0 INTRODUCTION.

     PIE (PROGRAMMA IMPROVED EDITOR) IS A TWO-DIMENSIONAL,
CURSOR-BASED EDITOR DESIGNED SPECIFICALLY FOR USE WITH MEMORY-
MAPPED AND CURSOR-ADDRESSED CRT'S.  IT IS TOTALLY DIFFERENT
FROM THE USUAL LINE-BASED EDITORS, WHICH WERE ORIGINALLY
DESIGNED FOR TELETYPES.  PIE INCLUDES THE FOLLOWING FEATURES:

      . BLINKING CURSOR

      . CURSOR MOVEMENT UP, DOWN, LEFT, RIGHT, PLUS TABS
```

Over 25 commands permit the cursor to be located anywhere on the screen, moved forward or backward a full page, search for a string, append, insert, delete, backspace, set horizontal tabs, and page scroll.

Price is $19.95 for cassette version. $24.95 for Apple diskette version. For details contact Programma International, Inc., 3400 Wilshire Blvd., Los Angeles, CA 90010, (213) 384-0579.

CIRCLE INQUIRY NO. 374

M6800 Pascal

Implementation requires only SWTP 6800 system (or equivalent) with sufficient hardware to support the TSC FLEX 1.0 operating system, making it possible to compile and run Pascal programs in as little as 12K + 4K bytes, using one mini-floppy disk.

The run-time system interfaces fully with FLEX, permits user device handling, and includes a paging facility which is invoked automatically if there is insufficient real memory for a large program.

In a 32K byte/1 MHz system with dual floppy disks, Pascal programs can be compiled at over 80 lines/minute. With only 16K + 4K bytes, compilation is at 35 lines/minute, under the paging mode of execution. The P-code generated by the compiler is compact and efficient, so that programs execute faster than with conventional (e.g. BASIC) interpreters.

Release Version 1.0 of the Pascal compiler and P-code interpreter/run-time system are provided on a FLEX 1.0 format mini floppy disk. User documentation, useful utilities and specimen programs are also supplied. For details contact Lucidata (Pascal Div.), Oosteinde 223, Voorburg 2271 EG (ZH), Netherlands.

CIRCLE INQUIRY NO. 375

EXIDY Programs

Public Computing, Inc. has announced the availability of six cassette programs for use on the Exidy Sorcerer.

The six programs make full use of the excellent graphics capabilities of the Exidy. Programs available now are Blackjack; Biorhythms; Sub/Ship Chase Game; Compucards, a personality test and fortune telling program; Atom, an inductive logic program in which rays are sent into a black box and are then deflected, reflected and/or absorbed, thereby allowing a player to determine the location of the atoms within the black box; and MAP, a three-mode program which displays a map of the United States with each state outlined, and offers CAI State Capitol quiz.

Price is $9.95 each or $19.95 for a set of any three. For details contact Public Computing, Inc., #10 N. Earl Ave., Lafayette, IN 47904.

CIRCLE INQUIRY NO. 376

Data Manager

LOOKUP is an easy-to-use data manager for the FLEX operating system. LOOKUP works with data records with the ability to add, delete, inquire, create, print, list and purge records. Applications range from a simple name and address list to financial or inventory record applications.

Data records may be variable length with variable number of fields. Data files may also be edited for massive or complex changes to records. Data is also accessible from BASIC for mathematical manipulations or custom reporting.

LOOKUP comes complete with 5" minidisk, reference manual, sample data file, source listing and source program on disk. LOOKUP is written in fast assembly language and runs in a minimum memory system.

Price is $49.95. For more information contact Mycroftware Systems, P.O. Box 1138, St. Charles, MO 63301.

CIRCLE INQUIRY NO. 377

TELESTAR

TELESTAR is a North Star Modem Operating System. This comprehensive assembly language package will allow North Star users the ability to transfer named disk files, timeshare from other systems, access computer bulletin services, access to other telestar users, run BASIC programs from a remote location etc.

The TELESTAR package will operate with most hardwire or acoustic modems running full or half duplex. The TELESTAR programs will self-patch to the individual user's I/O routines. Among several disk files included are the names of 13 hobby bulletin systems with instructions on how to use them.

For details contact Midwest Digital, 863 Wood Ave., Wichita, KS 67212.

CIRCLE INQUIRY NO. 378

Applesoft Program Saver

REVIVE is a machine language program that saves re-entering an Applesoft program that has been accidentally wiped out of NEWed before being saved on tape.

The secret to the operation of REVIVE is that when the program is wiped out by a NEW command, it is not erased from the memory. It is still there, but your Apple computer does not know where to look for it. REVIVE will tell it where it is and reset all the required pointers so that the program functions as if it were never erased.

REVIVE can be entered before you start programming or even after you've accidentally destroyed your Applesoft program.

Price is $8 on an Apple compatible cassette. For details contact Softsell Associates, 2022 79th St., Brooklyn, NY 11214.

CIRCLE INQUIRY NO. 379

The BPS Payroll

Better Programming Systems has added payroll to the BPS Employees' demographics, payroll decutions for withholding taxes and contributions, personnel benefits, allowances and vacation entitlement, plus employee pay type — salaried, contract, commission, hourly or piece worker - is carried in the system. Provision is made to accommodate one-time deductions and overtime compilations. Year-to-date and quarter-to-date gross pay and deductions are accumulated by category. Additional elements can be added to customize individual applications. Payrolls are computed for weekly, bi-weekly, semi-monthly and monthly pay periods.

The BPS PAYROLL runs on an Ohio Scientific 48K Challenger II or III microcomputer. The basic payroll package costs $500 as an option to The BPS. For details contact Better Programming Systems, 275 Ft. Washington Ave., New York, NY 10032, (212) 781-1861.

CIRCLE INQUIRY NO. 380

M6800 Commercial BASIC

Microsoft BASIC has been released in a new M6800 version. With the new BASIC, users of M6800-based microcomputers may immediately take advantage of the large existing library of Microsoft BASIC programs. All of the features of the 8080 BASIC have been implemented, including error trapping, edit mode, random access files, renumbering, 16-digit accuracy, full PRINT USING, and IF/THEN/ELSE.

The M6800 BASIC is licensed only on an OEM contract basis. For details contact Microsoft, 10800 NE 8th, Suite 819, Bellevue, WA 98004, (206) 455-8080, Bill Gates.

CIRCLE INQUIRY NO. 381

Relocating Assembler

A macro relocating assembler called REMAC from Southern Systems and written for the 8080 includes many advanced features normally found only on much larger computers. The assembler generates an object module which is fully relocatable (a loader program is included with the REMAC package) and in addition has external linkage capabilities.

REMAC assembler is compatible with Southern Systems deluxe symbolic debugging system, RAID, greatly facilitating the debugging process.

Price is $99.95. Documentation only $15. For details contact Southern Systems of Birmingham, P.O. Box 3373-A, Birmingham, AL 35205.

CIRCLE INQUIRY NO. 382

Dental Office Management

The Dentistaid^{TM} Program offers the dentist and his staff in-office control of his practice. The program features are: enter/delete patient record, record visit information, record payments, record recall information, display patient record. Also provides complete reports and printouts of individual statements: insurance forms, prequalification insurance form, accounts receivable/aging report, daily, monthly and yearly summary of work and payments, production analysis and monthly statements.

Requires Z-80 based microprocessor, 8K of application program memory space, random access dual diskette data storage, Centronics 779 printer, Soroc IQ120 CRT, North Star disk system with 32K RAM dual 5¼ floppy double density.

Price of $1,500 includes disk and manuals. For details contact Micro Computer Management, 200 W. Prospect, Ft. Collins, CO 80526, (303) 493-5700.

CIRCLE INQUIRY NO. 383

Pascal Compiler

Gamma Technology is now distributing a Pascal compiler for Data General's Advanced Operating System. AOS is a multi-user, multi-tasking operating system running on the Eclipse line of computers. The combination of Pascal's clear and structured approach to programming and an AOS timesharing system opens up many possibilities for on-line educational programming instruction and program development on a modest budget. AOS Pascal can also shorten program development time in production or research facilities with rapidly changing demands.

The compiler was developed from the University of Lancaster's RDOS implementation of the P4 standard of Pascal. The RDOS version has already been distributed to more than 130 sites around the world.

Gamma Technology's distribution of the Lancaster/AOS Pascal Compiler includes both source code and binaries, on 9-track, 800 bpi magnetic tape, for a charge of $300. For details contact Gamma Technology, Inc., 2452 Embarcadero Way, Palo Alto, CA 94303, (415) 856-7421.

CIRCLE INQUIRY NO. 384

Graphics Products Operating System

The 5216 Graphics Product Operating System — AYDOS — provides a fully integrated interactive, high performance operating system for its 5216 display processor. Based on a FORTH programming system, AYDOS uses a high-level language for convenient, flexible English-language control of all aspects of operation.

The system is resident in 4K words of PROM, with options supplied in additional PROMs. Options include multiprogrammed support for multiple terminals, displays, and control tasks, plus an extensive list of graphic and image-processing packages. Support for the disk based systems includes a software development package (resident 8086 assembler, AYDOS compiler, and text editor), and a complete database management package.

For details contact Aydin Controls, 414 Commerce Dr., Ft. Washington, PA 19034.

CIRCLE INQUIRY NO. 385

FTP

The RDA File Transfer Program (FTP) provides the facilities required to transfer files between two Digital Equipment Corporation LSI-11 or PDP-11 processors, using asynchronous communications on a local or remote basis. FTP runs under Digital's RT11 and RSX11-M operating systems.

Using standard low cost serial interfaces (DLV11 or DL11 type) FTP utilizes a defined protocol similar to those found in binary synchronous protocols such as 2780 and HASP. Provisions are included for error checking and data retransmission when required.

Loss of line is detected via time out for serial interfaces without modem control. Error detection is accomplished by parity checking, block count and checksum.

Basic license cost is $1,250. For details contact RDA, Inc., 5012 Herzel Pl., Beltsville, MD 20705, (301) 937-2215.

CIRCLE INQUIRY NO. 386

Utility Library

PLM Utility Library enhances modular 8080/8085 designs. The library contains 14 general purpose utilities that fall into 4 categories — data conversion, I/O, bit manipulation and data management. The utility library is linkable on Intel's MDS 800, or series II microprocessor development systems under ISIS.II version 3.4 operating system. All utilities come with detailed users information, examples, and source code on single or double density floppy disk.

Price is $156. For details contact Micro Control Technology, Inc., 12750 S.W. 2nd St., Beaverton, OR 97005, (503) 646-6550.

CIRCLE INQUIRY NO. 387

Disk Text Editor for Apple II

EDIT is a DOS text editor for the Apple II microcomputer designed to facilitate changes to disk files. Input and output via cassette is also supported. The Text Editor includes 25 commands and will edit fixed or variable length disk files. System commands allow the user to Delete, Insert, Change, Display, Add, and Print Records. String commands facilitate searching and changing part of a record or the entire file.

EDIT is written in Applesoft II extended BASIC and requires 16K of memory with an Applesoft ROM or cassette only version; otherwise a minimum of 24K is suggested.

EDIT is provided on cassette or Apple II diskette, complete with user manual. Price is $16.95. For details contact Unique, Inc., 2441 Rolling View Dr., Dayton, OH 45431.

CIRCLE INQUIRY NO. 388

Apple II Tiny Business Software

Custom Computing Systems is offering an interactive Tiny Business Inventory Management System, Accounts Receivable and Accounts Payable for the Apple II. The software offers a realistic approach to the capabilities of the Apple II in a Tiny Business environment.

Each software package requires a minimum system configuration of 48K and one disk drive and an optimum configuration of two disk drives and floating point firmware.

The Inventory Management System ($100) supports 820 separate inventory items and 100 suppliers. The Accounts Payable ($75) and Accounts Receivable ($75) software handle 150 accounts each. All software packages have password protection to allow the user security on sensitive portions.

For details contact Custom Computing Systems, Inc., 204 2nd Ave. N., Saskatoon, Saskatchewan S7K 2B5, (306) 242-7808.

CIRCLE INQUIRY NO. 389

General Ledger-Transaction Processing System

This General Ledger - Transaction Processing accounting system for North Star Horizon computers provides for the CRT display and file maintenance of the General Ledger file for up to 100 ledger accounts, general transactions entry and processing, and prints the Transactions Journal and Chart of Accounts Listing showing year-to-date amounts and monthly breakdown for each ledger account.

The software is written in North Star release 4 BASIC and requires a North Star (or equivalent) computer with NDOS, 32K of RAM, CRT terminal and printer.

Cost is $250 under user license agreement. For details contact Computer Applications Development Associates, Box 624, Beaumont, CA 92223, R.C. Mooney, (714) 845-3355.

CIRCLE INQUIRY NO. 390

House Cost Estimator Package

This is a package of 5 programs for house construction firms. With it you can show your customers all the components going into their houses and the cost of each component from a computer file of items and costs. You can use this package to produce a listing of every item they want in their house as well as a total cost estimate.

This package is written in CBASIC to run under a CP/M 32K system. Price is $550. For details contact Turner Enterprises, 7905 L St., Suite 210, Omaha, NE 68127.

CIRCLE INQUIRY NO. 391

Business Software

Univair Inc. has available a new line of 21 fully integrated and auto-chaining business software packages.

Some of the major programs include General Ledger, Accounts Payable, Accounts Receivable, Payroll, Inventory, Dental Management System, Medical Management System, Real Estate Multi-List, Insurance Agency, Credit Union, Database Management, Word Processing, and many others. All programs run under CP/M or IMDOS with Commercial Basic and 31K of RAM total.

Cost of each program on 8" IBM disk is $395 with complete source code and operator's manual. For details contact Univair, Inc., 10327 Lambert Int'l. Airport, St. Louis, MO 63145, (314) 426-1099, Scott Nielsen.

CIRCLE INQUIRY NO. 392

ZIP

With the S.S.I. ZIP (Z80/8080 source program conversion) package, the user may write programs in either the Intel or Zilog source code convention, which can later be converted to a designated source statement form.

The ZIP package contains two programs that are written in MACRO-11. The I80Z80 program converts the source program from the Intel 8080 mnemonic to the Zilog Z-80 mnemonic and the Z80I80 program converts the source code from Zilog Z-80 mnemonic to the Intel mnemonic.

Both packages are available for either the DEC RSX-11M or RT-11 operating system. Price is $250 each or $350 for both. For details contact Systems & Software, Inc., 2801 Finley Rd., Suite 101, Downers Grove, IL 60515, (212) 932-9320.

CIRCLE INQUIRY NO. 393

DBMS for TRS-80

MAILROOM PLUS is one of the most powerful data base record management systems ever developed for the TRS-80. MAILROOM PLUS is useful in any application requiring the management of records having to do with people. This includes clubs, churches, bulletin mailings, patient checkup reminders, plus an infinite number of business applications.

All data is stored sequentially as a single string then manipulated and sorted in memory. For display or printout, the string is disassembled to recover the original data inputs. This technique provides all the features of a random access file but with the sorting speed and data compacting of a sequential file.

MAILROOM PLUS requires a minimum of 32K memory and one or more disk drives. Price is $49.95. For details contact The Periperal People, Box 524, Mercer Island, WA 98040.

CIRCLE INQUIRY NO. 394

Word Processor

Interactive Microware's PRO-TYPE Word Processor features text editing and processing combined in a single, compact program (requires only 8K of memory). This permits interactive feedback of the results of editing, without any delay required to load a separate editor.

PRO-TYPE is completely compatible with any kind of input terminal (Selectric; Diablo; memory mapped video; or non-memory mapped video CRT) and any kind of mass storage device (North Star disk or Meca tape recommended).

Price is $75. Manual only $25. For details contact Interactive Microware, Inc., P.O. Box 771, State College, PA 16801, (814) 238-8294.

CIRCLE INQUIRY NO. 395

Apple II Disassembler

MICROPRODUCTS/APPLETEXT is a powerful new two pass disassembler for the Apple II microcomputer. This very useful programming tool disassembled any machine language program which resides in the Apple II; such as BASIC, the Disk Operating System and printer driver routines, etc.

MICROPRODUCTS / APPLE II
DISASSEMBLER
microproducts

The MICROPRODUCTS/APPLETEXT two pass Disassembler creates a text file for the MICROPRODUCTS/APPLE II (cassette or disk based) Text Editor/Assembler.

Price on cassette with instructions at $29.95. For details contact Microproducts, 2107 Artesia Blvd., Redondo Beach, CA 90278, (213) 374-1673.

CIRCLE INQUIRY NO. 396

One-Step Remittance Processor

SORC/800 is a One-Step Remittance Processor for the SORC/800 (powered by DEC LSI-11). Written in Remittance Processing Language (RPL) it enables the user to customize the handling of bills including partial payments, agency payments, odd payments, multiple checks, multiple documents, etc.

For details contact Computer-Link Corp., 14 Cambridge St., Burlington, MA 01803, (617) 272-7400, Richard Nelles, Dir. of Mktg.

CIRCLE INQUIRY NO. 397

Business Software

CALMICRO^{TM} Business Application Software Package includes Accounts Receivable, Accounts Payable, General Ledger, Payroll, Mailing Labels and Text Editor.

All software operates under CP/M. Application language OPUS II and Forte run-time program. Comes on single or double-density diskettes with user documentation.

For details contact California Microcomputer Co., P.O. Box 3199, Chico, CA 95927, (916) 891-1420.

CIRCLE INQUIRY NO. 398

Machine Language Programs for PET

The SYS7171 is a machine language monitor which allows a programmer or PET user to program in machine language or in BASIC without destruction of the monitor once it is loaded. Programs may be saved, loaded or written, yet SYS 7171 remains coresident and undisturbed. The user can skip from the SYS7171 monitor to BASIC and then return freely. SYS7171 also allows the user to append one BASIC program to another.

SYS8181 is a machine language renumbering program which requires only 1K of RAM for its operation. After SYS8181 is loaded, the user can then load a BASIC program and it will then be completely renumbered in a matter of seconds. It begins with line number 100 and then increments each line number by 10. SYS8181 also allows the user to select his own beginning line number and increment amount.

Price of SYS7171 is $29.71 and SYS8181 is $18.71. For more information contact National Artificial Intelligence Laboratory, P.O. Box F, Mobile, AL 36601, (205) 433-5529.

CIRCLE INQUIRY NO. 399

Application Software

Talos Systems has available application software for its DIGI-KIT-IZER graphic tablet. This unique software package includes seven useful programs written in Applesoft BASIC for the Apple II Computer.

In addition to X-Y coordinate location output, the user may have his own computer aided design system by capturing, moving and rotating preprogrammed logic symbols to construct circuit diagrams.

Other programs included are music generation by pen location, HIres graphics and LOres color graphics, each brought up by simply touching the menu selection area of the DIGI-KIT-IZER.

Price is $49.95. For details contact Talos Systems, Inc., 7419 E. Helm Dr., Scottsdale, AZ 85260, (602) 948-6540.

CIRCLE INQUIRY NO. 400

Multi-User BASIC

With Cromemco's powerful, new Multi-User Software, Cromemco Systems can now permit up to seven users to independently run BASIC programs. The introduction of the Multi-User capability for Cromemco Microcomputers provides an efficient, low-cost alternative to traditional time-sharing systems.

Multi-User BASIC

The efficiency and power of the Cromemco Multi-User System is accomplished in part through the memory bank select feature incorporated on Cromemco memory boards and the high performance disk drives used in Cromemco systems. The bank select feature permits the organization of memory space into 8 banks of 64K bytes each.

Price is $800. For details contact Cromemco, Inc., 280 Bernardo Ave., Mountain View, CA 94043, (415) 964-7400.

CIRCLE INQUIRY NO. 401

Rental Information & Income Program

RIIP is designed for the property owner or manager who rents property (of any kind) on a monthly basis, providing background information on each rental and complete income tracking.

Rental information for each unit includes up to three names, four phone numbers, date rented, rent and deposits. Income information for each rental including regular monthly payments, partial payments and year-to-date totals are tracked and maintained on file.

Rental status reports may be run at any time displaying any delinquent rentals with the pertinent information for the current pay period.

Year to date totals for each rental unit can be displayed on screen at any time this information is needed.

RIIP is available on cassette with complete documentation for the TRS-80 Level II and Apple II (Applesoft) microcomputers. Price is $25. For details contact Realty Software Co., 2045 Manhattan Ave., Hermosa Beach, CA 90254.

CIRCLE INQUIRY NO. 402

TRS-80 Chess

Written in Z-80 assembly language, the program (Level II, 16K) conforms to all rules of chess including castling, pawn promotion, and en passant captures. The program will note all Check, Stalemate and Checkmate situations and can preset the board to any playing situation before starting to play.

The TRS-80 graphics are used to present a very well-defined display with definite black and white pieces, solid board lines, and cross-hatching on empty white squares.

This program is an improved version of our original program for North Star users. Playing time has been decreased and five levels of play are now available.

Price is $19.95 on doubly recorded cassette and $24.95 for North Star disk and paper tape (w/o graphics) versions. For details contact Software Specialists, P.O. Box 845, Norco, CA 91760.

CIRCLE INQUIRY NO. 403

New FORTH® Package

polyFORTH^{TM} is a software package that combines the best features of FORTH's successful mini- and microFORTH® products in one flexible package. It is a fully interactive operating system and multi-level programming language that can cut software development time by 50-90% while reducing memory requirements 30-80%.

The standard polyFORTH package requires only 4K bytes of memory with an additional 2K bytes for the assembler and the text editor.

polyFORTH is now available for the TI9900 and 8080. For details contact FORTH, Inc., 815 Manhattan Ave., Manhattan Beach, CA 90266, (213) 372-8493.

CIRCLE INQUIRY NO. 404

TRS-80 Entertainment Software

Z-CHESS, a full featured chess opponent providing seven levels of difficulty, from "Blitz" to "Expert." Six moves of look ahead are possible, and Z-CHESS can solve mate-in-two problems quickly. Numbered squares and aboard setup mode are provided for ease of play.

BACK-40 is a superior backgammon challenger with an unrivaled graphic board display. "Doubling" is permitted, and every feature of a regulation backgammon match is provided — including the score.

DR. CHIPS is a fascinating program based on the famous "DOCTOR" and "ELIZA" programs. Machine language allows DR. CHIPS to analyze your sentences and talk back to you instantly.

All programs require a 16K Level II machine. Z-CHESS is priced at $17.95. BACK-40 and DR. CHIPS are $14.95 each. For details contact The Software Association, P.O. Box 58365, Houston, TX 77058.

CIRCLE INQUIRY NO. 405

General Ledger

B.I.S. has a comprehensive general ledger system designed for the user with little or no computer knowledge. The system comes with step-by-step instructions, and the programs contain error messages in plain English that guide the user through mistakes they may make.

The system is written in CBASIC-2 and runs under a 32K CP/M system with an 80-column printer. The General Ledger system is controlled by responding to menus. The user can select a profit loss statement or balance sheet for any month with QTD and YTD summaries. A trial balance is provided prior to posting journal entries as well as an audit trail during the posting.

The system will handle multiple companies' books on one disk and can be easily configured for various terminals. Price is $299.95. For details contact Business Information Systems, Inc., 7905 L St., Suite 210, Omaha, NE 68127.

CIRCLE INQUIRY NO. 406

T.D.Q. Utilities

The Utility program gives the Tape Data Query user greater flexibility in creating and maintaining data files on a microcomputer system utilizing dual audio cassettes. The English-like command language, provided with T.D.Q. Utilities, allows the user to create new data files from existing files.

Utility commands permit the changing of a file's name, its password, and the names of data elements within the file. A file's structure can be altered by adding new data fields or removing existing data fields. T.D.Q. Utilities is especially useful for customizing pre-defined application file-structures for individual use.

Prices range from $35 to $50. For details contact H. Geller Computer Systems, Dept. I, P.O. Box 350, New York, NY 10040.

CIRCLE INQUIRY NO. 407

Accounting Programs for Wang

Users with almost any configuration of Wang Laboratories, Inc. MVP, VP, T and PCS II computer systems can now run the full line of accounting programs available from Data Train, Inc.

DTI's accounting products include General Ledger Accounting (client write-up), Payroll (2), Accounts Payable, Accounts Receivable (2), and Fixed Asset Accounting. The products provide the user selectability of modular or integrated operation.

The user self maintenance features Payroll Tax Tables. Other features include report writers for user design of many regular and special reports, user control for custom setup, compatibility of operation on MVP, VP, T or PCS II, user selectability of disk storage devices, and non technical operators reference and training manuals.

For details contact DTI, 840 NW 6th St., Grants Pass, OR 97526, (503) 476-1467.

CIRCLE INQUIRY NO. 408

"Password" Feature for North Star

North Star users will be getting a PASSWORD added to their DOS and BASIC. This feature is comparable to that available on large computer systems. This allows authorized access to your disks since each disk may have a different password up to 23 characters long. The password is not contained in a separate file but is hidden.

The package is on a mini-disk containing DOSP, modified NS DOS; BASICP, modified NS BASIC to support PASSWORD; NEWPASWD, BASIC program allows changing password; INSTRUCT, BASIC file containing easy to use instructions.

Price on diskette is $32. For details contact HSC Computer Services, Ltd., P.O. Box 43, Brooklyn, NY 11236.

CIRCLE INQUIRY NO. 409

Automatic Prompting for Apple

Computer Headware has a new Apple model of its self-indexing query system, called "Wow! How'd All That Stuff get In There?" (WHATSIT?).

The Model A-1 answers typed-in questions by referring to disk data that it automatically stores and revises, as instructed in short "pidgin English" sentences.

A new "WHAT'S NEXT?" Request provides assisted operation, with automatic prompting. Also new is the Soundex Request, enabling WHATSIT to recognize entries that sound right, even when spelled incorrectly.

Besides squeezing at least 2,000 entries onto an Apple disk, WHATSIT cross-indexes them automatically under any desired headings.

Supplied on an Apple disk, WHATSIT comes with a readable 150-page manual with step by step instructions and numerous examples. For details contact Computer Headware, P.O. Box 14694, San Francisco, CA 94114.

CIRCLE INQUIRY NO. 410

Diagnostic Software for TRS-80

The new software is the only truly comprehensive diagnostic program for TRS-80 and is written in separate programs to test RAM, ROM, CPU, and I/O circuitry for errors.

All programs detect malfunctions in hardware circuitry which would result in faulty data output, serving as a preventive maintenance measure in addition to a diagnostic tool.

Price is $34.95 on cassette or diskette. For details contact VR Data, 777 Henderson Blvd., Folcroft Industrial Park, Folcroft, PA 19032.

CIRCLE INQUIRY NO. 411

Multi-User CP/M

Our Multi-User software allows up to four persons to operate CP/M independent of each other. Software now operating under CP/M will become Multi-User without any modifications.

Requires 1.4 CP/M, bank select memory boards and an interrupt board. The software is currently written for Industrial Micro Systems 16K or 32K RAM boards and (Cromemco - Artec Port 40H) memory boards. The program comes in 40K and 56K configurations. Each user has 32K of memory under the 40K system and 48K under the 56K system.

Price is $125 on 8" single density diskette. For details contact Provar, Inc., 6217 Kennedy Ave., Hammon, IN 46323, (219) 844-0370.

CIRCLE INQUIRY NO. 413

Microbench™ 8048/8748 Software

A series of computer programs to support applications development for the Intel 8048/8748 family of microprocessors, Microbench 8048/8748 is available from Virtual Systems. These programs operate on Digital Equipment LSI-11 and PDP-11 computers.

Included in Microbench 8048/8748 are a relocating assembler, linking loader, librarian and object file formatter. The assembler supports extensive macro and conditional assembly facilities, cross reference listings and provides for relocatable object modules. The linking loader provides linkage facilities, selective loading from libraries, and directives for specifying ROM/RAM alignment.

Microbench 8048/8748 software is coded in Macro-11 for high throughput and operates under all current DEC operating systems for 11-series computers.

Perpetual license fees start at $1,695. For details contact Virtual Systems, Inc., 1500 Newell Ave., #406, Walnut Creek, CA 94596, (415) 935-4944.

CIRCLE INQUIRY NO. 412

Modem Utility Program for North Star

TELESTAR is an 8080 assembly language package for transferring named disk files through the phone, via a modem, between twp 8080 or Z-80 computers that utilize the North Star disk system; communicating with any remote time-sharing system and saving all exchanged ASCII

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Q: Who said utility stocks yielding 11-13% in 1976 would at worst keep you ahead of inflation and at best surprise you with a profit?
A: Eliot Janeway.
Q: Who said gold bought in 1977 would be your best insurance against the collapse of the dollar?
A: Eliot Janeway.
Q: Who said a return to double digit interest rates in 1978 would keep the smart investor close to cash?
A: Eliot Janeway.

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CIRCLE INQUIRY NO. 26

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You're invited to help us celebrate our move to larger quarters. To mark this special occasion, we're offering you a one-time only $100 discount off the price of our Apple II Computer.

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data to disk; and for retrieving that data from disk for later display or printout. The program will also allow a remote user to access and share the inputs and outputs of any program that uses the North Star DOS for its I/O. The program was written for a North Star Horizon computer, but has a self-patch customizing routine for other types of I/O.

A two serial port system plus acoustic coupler modem is required and at least one party must be able to "answer" to use the file transfer mode.

Documentation includes customizing and operating instructions, a list of hobby timesharing systems that can be called using the program along with the passwords and a sample data file containing text received from a remote system.

Price is $15 on disk. For more information contact Leonard E. Garcia, 3517 Herschel Ave., Dallas, TX 75219.

CIRCLE INQUIRY NO. 414

Inventory Control System

Inventory Control gives periodic stock status reports that are too expensive to compile manually, yet so necessary to manage a growing business. With PolyMorphic Systems inventory control, you can start with minimum equipment for 600 inventory records, knowing that add-on storage is available should you later need up to 2400 records.

Each record provides part number, description, supplier number, data for up to three outstanding purchase orders (date, quantity, P.O. number), weighted average cost, re-order point, data of last issue, date of last receipt, balance on hand.

The user can easily create new inventory items and post inventory transactions. At any time you may print out a stock status report which includes total inventory value as well as value by category.

For details contact PolyMorphic Systems, 460 Ward Dr., Santa Barbara, CA 93111, (805) 967-0468.

CIRCLE INQUIRY NO. 415

Pascal

Pascal for process control and other special purpose computers is now available from Process Computer Systems, Inc. PascalPac is a new software operating system currently released for use with many levels of PCS's broad range of microcomputer hardware.

This operating system supports a Z80 macro assembler, a Pascal compiler, a BASIC compiler, and a Link Editor with extensive library capabilities.

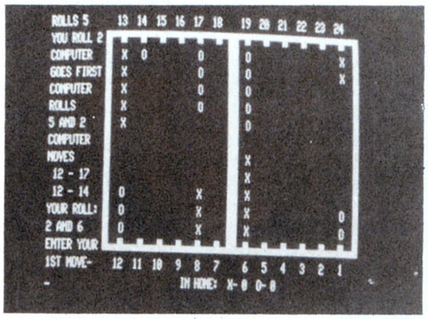
As an operating system, PascalPac features a sophisticated interactive text editor for preparing programs and documentation. Included in the operating system is a Filer which allows the creation of named files of multiple data image types and directory creation and maintenance.

For details contact Process Computer Systems, Inc., 750 N. Maple Rd., Saline, MI 48176.

CIRCLE INQUIRY NO. 416

Backgammon-Playing Program

FASTGAMMON is the name of a backgammon-playing program now available for several home computer systems, including TRS-80 and Apple. The computer's decision-making is usually less than a second per move.



```
ROLLS 5
YOU ROLL 2
COMPUTER
GOES FIRST
COMPUTER
ROLLS
5 AND 2
COMPUTER
MOVES
 12 - 17
 12 - 14
YOUR ROLL:
2 AND 6
ENTER YOUR
1ST MOVE-
-
IN HOME: X-0 O-0
```

FASTGAMMON displays a backgammon board on the vide screen. The computer rolls the dice and displays the roll. The player inputs his or her moves and watches as the men move from point to point on the board.

Price is $20 on cassette or $25 on diskette. For details contact Quality Software, 10051 Odessa Ave., Sepulveda, CA 91343.

CIRCLE INQUIRY NO. 417

Order Entry Package

E & L Data Systems comprehensive order entry software package includes order entry, billing, back order processing, inventory control, purchasing and sales analysis. Some of its features are extensive editing of input data, detailed error messages, audit trails of all transactions and random update of all files.

The first version is written in CBASIC2 to operate under CP/M. The package is furnished with complete documentation and a one year subscription to all updates and new programs which may be added to the system. For details contact E & L Data Systems Ltd., 33 Dankoff Ave., Wallington, NJ 07057, (201) 471-6462.

CIRCLE INQUIRY NO. 418

Accountant Package

The C.P.A. Package features computerized client write-up capability, general ledger with audit trails, and automatically keeps track of computer and accountant time for client billing purposes.

The C.P.A. write-up package features financial statements such as balance sheets, income statements, and changes in financial position, with flexible defined formats. The general ledger chart of accounts offers trial balance and detail ledger with complete audit trails.

The system will also permit the accountant to maintain separate files on-line simultaneously, allowing easy access to client data. The system keeps track of the time the accounant spends on each client's work, which facilitates billing. This feature also permits billing of computer resources used by each client.

For details, contact Advanced Information Design, P.O. Box 2144, San Jose, CA 95019, (408) 732-4744.

CIRCLE INQUIRY NO. 419

PET Software

ENTRY — used as a general purpose data entry program for business applications with user definable entry format. Price $24.95.

PROCESS — General purpose data process program designed for limited data processing power on the PET. Particularly useful for merging large amounts of data from different input sources. Price $24.95.

DCE TEXT EDITOR and FORMATTER — Full use of screen editor includes all cursor movements with repeatable cursor. Data is exactly what is seen on the screen, pages may be scrolled up and down. Price $24.95.

INVENTORY — Inventory control program on the PET Data includes item number, description, quantity on hand, reorder limit and prices. Data may be insert, delete, change, on the memory instantly. Price $24.95.

For details contact Home Computer Centre, 6101 Yonge St., Willowdale, Ontario M2M 3W2, Canada.

CIRCLE INQUIRY NO. 420

MICRO PLOT

MICRO PLOT is a set of FORTRAN, COBOL or Assembly language callable routines which convert any daisywheel printer into an incremental plotter. Printers supported include the Qume Spring 5 and 300Q, Diablo Hi-Type I and Diablo Hi-Type II (1610/1620), and the DTC 300A. The subroutines provided in the PLOTLIB.REL file include PLOT to control all pen and paper movements; PLOTS to initialize and change plotting parameters; HLINE to draw horizontal lines; VLINE to draw vertical lines; SYMBOL to print alphanumeric characters at any given plotting position at a specified angle; NUMBER to print numeric data as a character string at any location at a specified angle; SCALE

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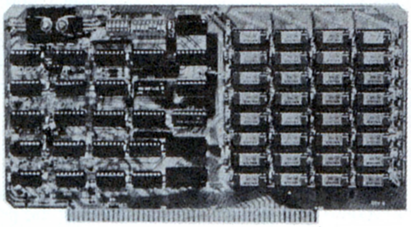

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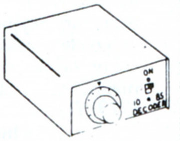

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3. PERSCI 70 and 277
4. MFE 700/750
5. CDC 9404/9406

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1771	**29.95**

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CIRCLE INQUIRY NO. 84

apple computer

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*Rom and ram test.

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Softape's Screen Machine	Cassette $19.95
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CIRCLE INQUIRY NO. 56

to determine starting value and optimum scaling factor for use by AXIS and LINE; AXIS to draw an axis line with appropriate scale annotation and centered titles along the axis line; LINE to plot a series of scaled data points and optionally print a centered symbol and connect the points with line segments.

Price is $295 on 5" or 8" disk. For details contact Micro Applications and Hardware, P.O. Box 22212, San Francisco, CA 94122, (415) 664-0778.

CIRCLE INQUIRY NO. 421

PET Software Collection

Series One is a collection of 25 programs for the Commodore PET. For less than one dollar each, Series One contains 16 games and 9 general programs.

Game titles include Space Wars, Motorcycle Jump, Saucer Attack, Ping Pong, Bomb Squad, Crack the Safe, Bombs Away, Bite the Wall, Auto Race, Break Away and six others.

Other programs include Mortgage Loan, Perpetual Calendar, Elementary Math, Savings Account, Clock, and more.

All programs will run on the 8K PET or the full-keyboard 16K or 32K models. Most of the programs take full advantage of the graphics capability of the PET.

Price is $24.95. For details contact ADP Systems, 95 W. 100 South, Logan, UT 84321.

CIRCLE INQUIRY NO. 422

Text Output Processor

SCRIPT-80 is an 8080 microcomputer based text output processing program, compatible with the SCRIPT text processors available on most large mainframe computers, developed to handle form letters, document files, and mailing lists that were processed on an IBM 370. SCRIPT-80 can bring the document handling power of these large machines to owners of 8080 or Z-80 based microcomputers.

The SCRIPT-80 system supports over 50 standard SCRIPT commands for the combining of multiple files, formatting and right justifying of text, margin and line length control, centering of title lines, spacing, immediate and conditional page eject, page headings, page footings, and several formats of page numbering.

SRC-H80 single drive hobbyist version, $45; SRC-P80 multi-drive professional version, $125; SRC-C80 full commercial version, $625; SRC-x80 manual alone for any version, $25. For details contact J. Vilkaitis, Consultants, P.O. Box 26, High St. Ext., Thomaston, CT 06787, (203) 283-4232.

CIRCLE INQUIRY NO. 423

Business Software

Taranto & Associates offers TRS-80 conversions of Osborne & Associates accounting programs. The Cash Journal Transaction Program, an addition to the General Ledger package, will make bookkeeping an easy chore for the small businessman.

The conversions available for the TRS-80 include the Accounts Payable, Accounts Receivable, General Ledger and Payroll systems. The programs, which are supplied on ready-to-run system disks, are almost exactly the same as those in the Osborne publications, only the job-posting functions have been eliminated. The application publication includes the complete documentation for each system.

For more information contact Taranto & Associates, P.O. Box 6073, San Rafael, CA 94903.

CIRCLE INQUIRY NO. 424

Tiny-C Interpreter for TRS-80

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The TRS-80 cassette version is recorded in Level II system format and includes line printer and graphics support. At least 16K bytes of RAM is recommended for its effective use. The load-and-go TRS-80 cassette costs $30.

The CP/M and North Star installations are fully interfaced to their respective disk operating systems. The CP/M diskette also contains the source code of the tiny-c interpreter. Both CP/M and North Star diskettes cost $35.

For details contact tiny c associates, P.O. Box 269, Holmdel, NJ 07733.

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Cross Assembler

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Price is $550. For details contact Xener Corp., 6641 Backlick Rd., Springfield, VA 22150, (703) 569-5050.

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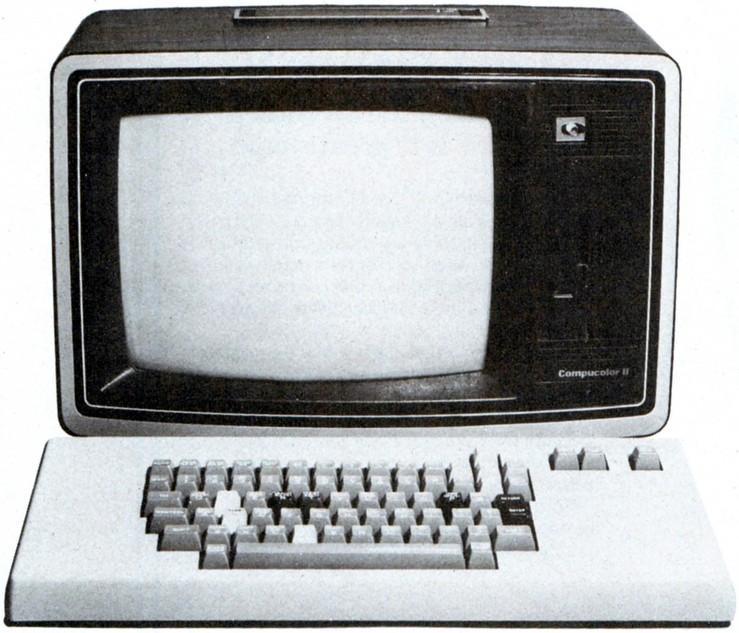

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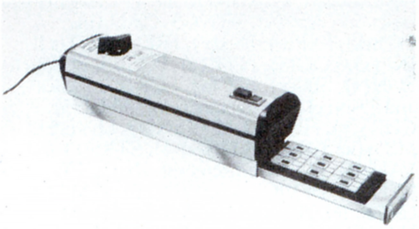

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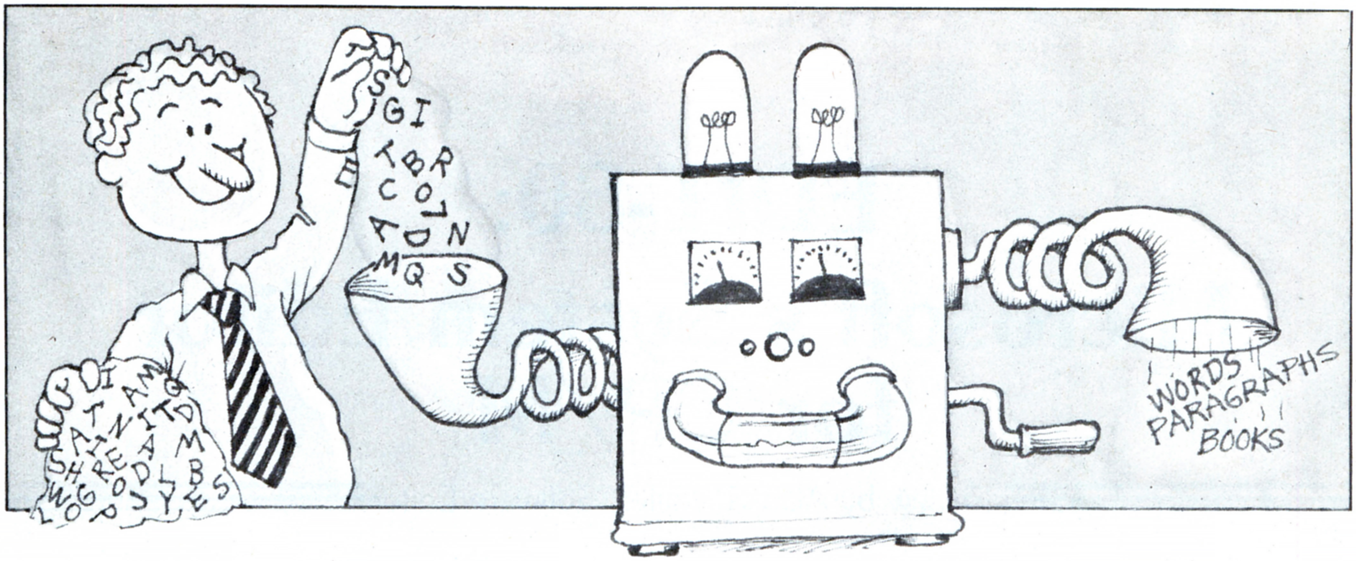

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EDIT-80: Microsoft's System Editor for CP/M

Review by Alan R. Miller, Software Editor

INTRODUCTION

One of the usual features of a disk operating system is a text editor. This system editor may be used to create and alter source files for the assembler, the FORTRAN compiler, or the BASIC interpreter. It can also be used to create ASCII data files such as this article.

CP/M was a powerful disk operating system that was reviewed in the July and December 1978 issues of INTERFACE AGE. It has several built-in commands that allow the user to list, alter, and create files on the system disks. In addition to the built-in commands, there are transient programs. These are complete routines that can be copied from disk into memory, then executed. For example, the Microsoft FORTRAN package, which was reviewed in the March 1979 issue of INTERFACE AGE, contains four separate transient programs: the compiler, the linking loader, the assembler, and the library manager.

THE CP/M SYSTEM EDITOR

The regular CP/M system editor, called ED, is a transient program that occupies about 6K bytes of memory. A disk file can be altered by copying some of the lines from disk to memory with the A (append) command. When these lines have been edited, they are written to a new disk file with the W command. Then more lines of the original file are appended to the edit buffer in memory. In this way, very long files can be edited by passing a portion at a time through the edit-buffer "window."

Since ED is a character-oriented editor, the commands are very different from those of line-oriented editors available in Extended BASIC or on large computer systems. With ED, the user can refer to the carriage-return, line-feed pair (<CR>,<LF>) as if they were an ordinary alphabetic character. The command:

```
*MS^L (8 blanks) $^L^I^Z
```

will substitute each occurrence of a <CR>,<LF> followed by 8 blanks with a <CR>,<LF> and a tab.

Two adjacent lines can be joined into a single line by deleting the <CR>,<LF> pair between them. Alternately, a single line can be broken up into two lines by insertion of a <CR>,<LF> (using a Control-L).

Another advantage of ED is that the user can build up files of frequently needed routines, such as those used for input, output, etc. These routines can be copied from disk into another program that is being created or edited.

While these features can sometimes be useful, there are several disadvantages to this style of editor. It is difficult to make changes, and to observe the results of the change.

MICROSOFT'S EDITOR

Microsoft, the organization that wrote MITS BASIC, offers a line-oriented editor, called EDIT-80. It is a perfect complement to ED, although it is more than twice as large (14K bytes). It is virtually indistinguishable from the system editor on the DEC-20, a 36-bit word machine. ED and EDIT-80 both use the same format for the edit buffer:

```
ASCII text <CR>,<LF>
```

(ASCII text with tabs, carriage return, line feed) so that they can be used interchangeably on the same files. This is not true of other editors, especially those based on the Processor Tech SP1. (See the October 1978 issue of INTERFACE AGE.) These latter editors include at the start of each line a binary number that gives the line length (as though a computer can't figure that out).

USING EDIT-80

EDIT-80 is executed with the command:

```
A>EDIT80 <filename> <CR>
```

where <filename> is the usual CP/M filename. It is also possible to type:

```
A>EDIT80 <CR>
```

in which case the response is:

```
file:
```

Type in the file name. In either case, include the disk drive A:, B:, C:, or D: if the file is not on the default drive. Also, give the file extension, .BAS, .FOR, etc. Type <escape> if a new file is being created. Finally, type a carriage return. The star prompt symbol appears, as with ED, to indicate that EDIT-80 is at the command level. Pressing <linefeed> will display the first line of the file. It is not necessary to give a specific command to append lines of text to the edit buffer. EDIT-80 automatically takes care of passing the source file through the edit buffer window.

VIEWING THE TEXT

By repeatedly typing a linefeed (vs. a carriage return for ED), successive lines of the file can be viewed on the console. Pressing <escape> will print the prior line. Typing a P<CR> will print the next 20 lines.

THE INTERLINE COMMANDS

The interline commands refer to complete lines; they must be given in upper-case letters for version 1.

A	alter
D	delete
F	find a string
I	insert
L	list (on the list device)
N	renumber
P	print (on the console)
R	replace
S	substitute one string with another

The argument following the command may reference a single line:

D200	delete line 200
P.	print current line (pointer)
A^	alter the first line
I*	insert after last line

or a range of lines:

P200:500	print 200-500
D.:*	delete current line to last
L^:*	list first to last
D.!4	delete present and next 3

where the ^ symbol refers to the first line, * the last line, and the period the current line (the pointer). The colon is used for a range separator and the exclamation point is used to indicate how many lines are to be included.

INTRALINE EDITING

Characters within a line are altered by first giving the A command (in upper case). The following intraline commands can then be given in lower case, and of course lower-case letters can be inserted or deleted.

CURSOR MOVEMENT

The cursor can be moved to the desired location by any of several commands:

<space>	move one space
–<space>	backup one space
n<space>	move n spaces
–n<space>	backup n spaces
<tab>	move to end of line
–<tab>	move to beginning
L	look at whole line, set cursor to beginning
P	print whole line, return cursor to original position
W	move to next word
–W	move to prior word
nW	move n words

Characters are inserted at the cursor position by typing:

I	insert until <CR> or <ESC>
B	insert a blank
nB	insert n blanks
nGr	insert n copies of character r
X	(extend), add text to end

Characters are deleted with:

D	delete next character
nD	delete next n characters
n<del>	same as nD
nKr	(kill) delete to nth occurrence of r
nZ	(zap), delete next n words

Replace characters with:

nR	replace, a combination of D and I
nC	change, a one-to-one replacement

Find characters with:

nS	search for nth occurrence of character
nF <ESC>	find next given string

End the alter mode with:

<CR>	normal end
Q	quit, changes not saved
^U	restore original line, stay in alter mode

There are also several additional commands. All of the edit commands are summarized on two pages at the back of the 38-page user's manual. Suprisingly, there is no J command for joining and unjoining lines.

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PAGING

The default line increment is 100 and the maximum line number is 99999. Therefore, if there are more than 1,000 lines in the file to be edited, either the line increment must be reduced or separate pages must be created. A page mark, a Control-L, is inserted with an M command. The resulting Control-L can eject a new page on line printers. The command:

```
M.
```

inserts a new page after the current line. Line numbers on each page may run from zero to 99999. Page numbers are referenced by use of a slash. Thus:

```
P300/1:200/2
```

will print from line 300 page 1 to line 200 page 2, and

```
P^/^:*/*
```

will print all lines.

Page marks are deleted with a K (kill):

```
K/2
```

deletes the marker for page 2. The next page mark, if any, that is used to indicate 3, now indicates page 2. It could be deleted with another:

```
K/2
```

There is no page marker for page 1. It will be necessary to renumber the lines (with the N command) after killing a page mark, if the lines are out of sequence.

ENDING THE EDIT

The edit session can be ended with an E, an optional filename, and one or two switches. If no filename is given, the new file gets the original filename, and the file type of the original file is changed to BAK. This is the same as with the editor ED. The new file can be assigned another name at this time, however, and then the original filename is unchanged. One of the switches can be /BASIC and the other can be either /SEQ or /UNSEQ.

The simplest method of editing a file is to give the original filename at the beginning of the edit session, but leave out the switches. Then end the edit with the command:

```
E/UNSEQ
```

The /UNSEQ switch will strip off the line numbers and the tab that follows before saving the file. Line numbers are not needed for assembler and FORTRAN source programs, although the Microsoft programs don't care if line numbers are present or not. The command sequence:

```
*<filename>
 •  •
 •  •
E/UNSEQ
```

can also be used for editing existing BASIC programs. EDIT-80 will place additional line numbers in front of those present, then remove them at the end of the edit. This appears to work better than allowing EDIT-80 to use existing BASIC line numbers.

There is a potential problem in using BASIC line numbers for the edit session. If the renumber command N is given, the file will become useless. This occurs because the BASIC branch commands such as GOTO 200 won't get changed along with the line numbers.

There is also a possible potential problem with leaving the EDIT-80 line numbers in the file (with the /SEQ switch). These numbers and the following tabs have the high-order bit turned on. Thus the CP/M TYPE command will not correctly list such lines. Also, both the numbers and following tabs will be rendered as periods during ASCII display by the system debuggers SID and DDT.

EDIT-80 traps all console input, isolating it from CP/M. This means that accidentally typing a Control-C will not prematurely end the session with return to CP/M.

A BUG IN VERSION 1

A good way to alter or delete a line with EDIT-80 is to first print the line:

```
P 1500
D .
```

using the decimal point (pointer) to refer to the line just printed. There is a bug in version 1, however, which must be considered. The line prior to the current line can be printed (and presumably made the current line) by pressing the escape key. EDIT-80 prints the prior line in this case, but the decimal point now incorrectly refers to the last line in the file. A command of D. will therefore delete the last line rather than the current line. This bug will undoubtedly be fixed in later versions.

FILCOM

A separate transient program, FILCOM, is also included on the EDIT-80 diskette. This utility program can be used to compare two disk files. The differences, if any can be placed in a third disk file, or can be sent to the console or line printer. The program is initiated with the command:

```
A>FILCOM <CR>
```

and the response is a prompt of a star, as for EDIT-80. Type the output file name, an equals sign and the names of the files to be compared, separated by a comma.

```
*DIFF.ASC=FILE1.ASM,FILE1.ASM
*TTY:=FILE1,FILE2
*LST:=FILE1,FILE2
```

Differences for the first example are placed into a file named DIFF.ASC. The second example sends the differences to the system console and the third example sends the differences to the list device.

The comparison is not strictly mechanical, but more like a human being would do it. When a difference is encountered, the files are searched for another match. Thus if one file has an extra line, only that one line will be printed as a difference. FILCOM will then move past the difference and discover that the rest of the text matches. Spaces and tabs are not used in the comparison, since these characters are not usually meaningful. Also characters following a semi-colon are ignored, since these are usually comments. Both of these options, however, can be changed with switches. Actually, there are five switches that can be set. These are:

/S	spaces and tabs
/C	comments after semi-colon
/n	number of lines needed for match
/A	source compare on REL and COM files
/B	compare binary files

If the files being compared are the same, no message is generated.

CONCLUSION

EDIT-80 is written in the grand style that is typical of Microsoft's other programs such as BASIC and FORTRAN. There are more than enough commands to satisfy anyone. The two intraline editing commands S (search) and K (kill) provide a powerful mechanism for rapidly finding a character, then deleting down to another character.☐

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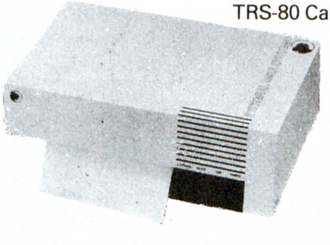

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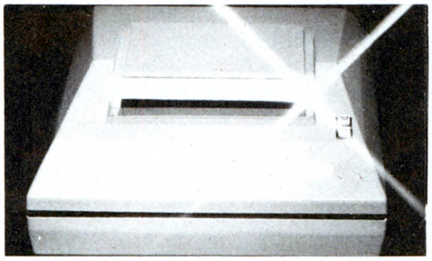

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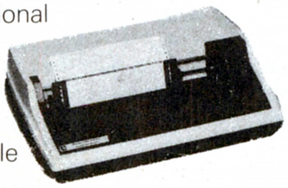

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Flexing with FLEX™ Utilities

By Jim Schreier, Associate Editor

FLEX™ is the disk operating system supporting SWTPC's MF-68 dual minifloppy and the DMF-1 standard floppy disk systems. FLEX is the work of Technical Systems Consultants, Inc., located in West Lafayette, Indiana. TSC and SWTPC have produced an organized operating system broken into three key areas: The file management system, the disk operating system and the utilities. Since the utilities may be added as necessary, a mind-boggling amount of disk manipulation sits ready to use. This article examines the variety of currently available FLEX utilities.

The original FLEX software, provided at no charge with the purchase of the SWTPC disk systems, contains 23 utilities. TSC now offers 36 more utilities in six volumes and another 12 are in the oven. With 59 utilities now on-line, "pumping iron" with the disk system is a thing of the past.

Each reference to a TSC FLEX utility will be followed by a volume number, 0 through 6. Zero will indicate the original utilities supplied with the disk system.

THE TEXT UTILITIES

TSC's optional text editing system (version 255) is FLEX-compatible, making extensive disk text files possible. Once the text (or BASIC) files are created, manipulation may occur in several ways.

Two files may be "welded" using the APPEND(0) utility. If, however, it's necessary to list and allow concatenation of a number of files, CONCAT(5) does the trick.

Once the files are "welded," a string search may be needed. Do not re-load the editor or BASIC program. The FIND(1) utility locates all occurrences of a given string within the files. It even reports the line numbers. The FIND(1) utility in one swoop makes all those complex and slow BASIC file programs (for a collection of Mark Twain or species of cacti) unnecessary. Once the files are created, what you need to know is only a few seconds away.

The WORDS(1) utility is a blessing for research paper authors. It counts the words and lines in a text file. Now when the teacher wants 500 words on Wordsworth, exactly 500 will come out.

Misspelled words are a problem I blame on Noah Webster. Since we have been struck with the problem for over a century, TSC has a unique solution. The TYPOS(1) makes a list of every word used in the text file and gives them back in descending order based on the number of times the word has been used. Besides misspelled words, the overuse of certain words may be noted.

TSC offers three utilities for those printers that never seem to accept text in caps, or lower case, depending on the system. LOW-UP(1) converts the lower case ASCII text to upper case while UP-LOW(1) reverses the process. PRUL(4) converts an upper case text processor file to both upper and lower case.

The optional TSC text processing system may be bypassed to some degree with FLIST(3). This utility prints a text file with the title and correct page number on each page.

If text files become too large, REMSPC(5) removes excess spaces while the SPLIT(1) utility allows splitting of a single file into two files at any given line number. The original file remains unchanged.

WHAT'S ON THIS DISK?

The original CAT(0) command allows either comprehensive or very selective cataloging as the user wishes. Since the output is strung out vertically, slow CRT readers (under 1200 baud) are out of luck the first time around. The FILES(4) utility command eliminates sectors, file sizes, etc. and neatly formats the output according to the size pre-set, using the TTYSET(0) utility, to the columns of your CRT. (This is done using the TTYSET width function.) The DIR(3) utility expands the CAT(0) command showing the file name, sector size, file number, and the beginning and ending disk addresses. Use of the DIR(3) utility is necessary to have the necessary information to recover files from a crashed disk using the RECOVER(6) command.

The FREE(3) command reports the number of available sectors and bytes. The INTEG(6) utility tests the integrity of the disk's free sectors and TEST(3) reads and checks for any bad sectors on the disk in question. Each of these commands takes some time to report results.

THE BINARY UTILITIES

Besides BASIC and text files, FLEX supports binary files. Two original utilities, GET and LINK(0), allow manipulation of binary files. GET loads binary files into RAM and LINK appends the files starting HEX address.

The use of binary disk files seems to cause the most difficulty with FLEX users. The main problem is the reversing of the duplex function at the terminal. At this point TSC does not offer a solution, but does offer a number of helpful utilities.

The OLOAD(2) utility is similar to GET but allows the specification of an offset address to offset the file in memory. This is helpful for PROMs. The MAP(3) utility states the load and transfer addresses of a binary file.

The original FLEX utilities made two steps necessary to bring up a binary file. Use of the INSTALL(3) utility converts the .BIN extension to a .CMD extension. As such, a binary file may be loaded at once just like all of TSC's FLEX commands.

LEFTOVERS

Within the 59 TSC utilities, two provide promise but seem to have no immediate application. One is SLEEP(5). It has the same effect on computer systems as Mr. Spock's famous knock-em-out nerve pinch. Other than keeping your mother-in-law out of your computer system, SLEEP just "eats up time."

The utility having potential but no place to go is DATE(4). This utility sets up a system date register, changeable at will. In effect, today's date may be used by other FLEX utilities, but so far no other FLEX utilities seem interested in the date.

A number of other utilities, including two memory tests, are included at this point. The new 36 utilities are included on two mini-floppies with listings and instruction provided in a handsome, and expensive, three-ring binder. Since the listings lack consecutive page numbers, finding a specific utility can be frustrating. This is something TSC may correct.

Even with the current cornucopia of FLEX utilities, TSC has put out a call for FLEX users to continue adding utilities to the library. A FLEX newsletter has been announced, but Dave Shirk, president of TSC, indicates that response has been slow.

Although a number of minor problems have been pointed out, the concept of disk utilities makes disk operation a real treat for SWTPC disk users.☐

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428 Memorex
429 Pryor
430 Radio Shack
431 TDK
432 Scotch (3M)
433 Other

I buy the following number of cassette tapes in an average month:

434 1-5
435 6-10
436 Over ten

I spend the following on cassette tapes per year:

437 5-25 dollars
438 25-50 dollars
439 50-100 dollars
440 Over 100 dollars

I use a cassette tape:

441 Once only
442 Several times

(This refers to the number of times a tape will be reused)

I generally buy the following length of tape:

443 15-minute (C-15)
444 30-minute (C-30)
445 60-minute (C-60)
446 90-minute (C-90)

My favorite brand of cassette tape is:

447 Ampex
448 BASF
449 Memorex
450 Pryor
451 Radio Shack
452 TDK
453 Scotch (3M)
454 Other

FLOPPY DISKS

I have used the following brand(s)

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456 BASF
457 Dysan
458 Memorex
459 Pryor
460 Scotch (3M)
461 Verbatim
462 Other

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463 1-5
464 6-10
465 Over ten

I spend the following on diskettes per year:

466 1-55 dollars
467 56-100 dollars
468 101-200 dollars
469 Over 200 dollars

I use a diskette:

470 Once only
471 Several times

(This refers to the number of times a diskette will be reused)

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My favorite brand of diskette is:

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477 BASF
478 Dysan
479 Memorex
480 Pryor
481 Scotch (3M)
482 Verbatim
483 Other

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I need more information on: Check only ONE below, if applicable.

501 ☐ Hardware 502 ☐ Software 503 ☐ Peripherals 504 ☐ Components

ANSWER THE FOLLOWING BY CHECKING ONLY ONE BOX PER QUESTION

1. My Field is:
A. ☐Professional (Medical, Accounting, Law, Etc.)
B. ☐Engineer (Mechanical, Electrical, Etc.)
C. ☐Business (Retail, Wholesale, Etc.)
D. ☐Educational (Professor, Teacher, Assistant, Etc.)
E. ☐Government (Armed Services, State, Federal, Etc.)
F. ☐Consumer (Hobbyist, Etc.)
G. ☐Other

2. My Position/Title is:
A. ☐Owner/President
B. ☐Executive Officer
C. ☐Division/Department Manager
D. ☐Supervisor
E. ☐General Staff Member
F. ☐Consultant
G. ☐Other

3. I Need This Information for:
A. ☐Immediate purchase
B. ☐Purchase 30-60 days
C. ☐Comparisons
D. ☐Literature Library
E. ☐Other

4. My Application is:
A. ☐Business Only
B. ☐Business and Personal
C. ☐Personal Only
D. ☐Instructional
E. ☐Research and Development
F. ☐OEM
G. ☐Other

5. My Interest Emphasis is:
A. ☐Hardware
B. ☐Firmware
C. ☐Software
D. ☐Other

6. My Professional Interest is:
A. ☐Accounting System
B. ☐Inventory Control System
C. ☐Process Control System
D. ☐Medical Research
E. ☐Educational System
G. ☐Other

7. My Personal Interest is:
A. ☐Games
B. ☐Home Economics
C. ☐Computer Art and Graphics
D. ☐Personal Investments
E. ☐Child Educational Development
F. ☐Sports
G. ☐Other

8. My Budget for a Computer System is:
A. ☐$ 0 - $ 1,999
B. ☐$ 2,000 - $ 4,999
C. ☐$ 5,000 - $ 9,999
D. ☐$10,000 - $20,000
E. ☐Over $20,000

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